Masticophis
lateralis

Masticophis
lateralis

Mayhew
1958

Masticophis lateralis

July 22 — UCR campus, Riverside Co., Calif.

I noosed a large specimen on the south edge of the campus this morning (about 0920). It remained perfectly still, even though I was within 3 feet of it. It took me at least 30 seconds to get rid of the extra gear and get the noose ready. It didn't move until I had it securely noosed. Then it whipped its hind quarters all over the place. It was between 3 and 4 feet long. As we had nothing to put it in, we released it a moment later.

July 23 — At 1400 today I saw an adult resting in a cavity under the top of the rock pile we use to take temperature measurements. Earlier in the day an adult *Neotoma* sp. was resting in the same spot. We caught it by the tail, but I lost it down a hole in the rock.

1960

Apr. 13 — 7 mi. W. of Glamis, Imperial Co., Calif.

About 1400 an adult was seen curled around the base of a *Larrea divaricata* in broken shade. It made no movement until I tried to remove it from its location by means of a hook. It eventually escaped down a hole beneath the same bush. I returned to the bush later in the day, but no snake was seen.

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Phrynosoma
coronatum

Phrynosoma
coronatum

Phrynosoma coronatum

Mayhew
1958

May 12 — Univ. Calif. campus, Riverside, Riverside Co., Calif.

This morning a ♂ was seen copulating with a ♀ while another ♂ stood by. The ♀ was on her back with her hind legs kicking rather feebly at the ♂. He lay still on top of her all the time that they were under observation.

Aug. 4 — This morning Frank Awbrey brought in a ♀ that seems to be quite full of something. We placed her in a terrarium in the office to see what transpires.

1959

April 14 — 1 mi. N.W. of Phelan, San Bernardino Co., Calif.

This afternoon we found an adult ♂ near the base of a Joshua tree at an altitude of about 4100 ft. The animal was quite active, and almost succeeded in eluding us.

May 9 — 2 mi. N. of Cedar Springs, San Berdoo Co., Calif.

Today 3 animals were caught fairly close to the bank of the Mojave River. They were in sandy locations a short distance from the water in the stream. All of them were collected for reproductive data.

1962

May 18 — Bautista Canyon, Riverside Co., Calif.

2 animals were found beside the road in this canyon today.

Phrynosoma coronatum

12 Univ. Calif. campus, Riverside Co., Calif.

This morning a ♂ was seen copulating with a ♀ while another ♂ stood by. The ♀ was on her back with her hind legs pinching rather feebly at the ♂. He lay still on top of her all the time that they were under observation.

4 This morning Frank Aubrey brought in a ♀ that seems to be quite full of something. We placed her in a terrarium in the office to see what transpires.

14 1 mi. N.W. of Phelan, San Bernardino Co., Calif.

This afternoon we found an adult ♂ near the base of a Joshua tree at an altitude of about 4100 ft. The animal was quite active, and almost succeeded in eluding us.

9 2 mi. N. of Cedar Springs, San Bdno Co., Calif.

Today 3 animals were caught fairly close to the bank of the Mojave River. They were in sandy locations a short distance from the water in the stream. All of them were collected for reproductive data.

18 Bautista Canyon, Riverside Co., Calif.

2 animals were found beside the road in this canyon today.

1962

Oct. 9 UCR, Riverside Co., Calif.

This morning I put the 2 juveniles Ken Evans gave me last month, & the adult I caught in Baja Calif. April 23, 1961, into a terrarium in the vivarium to hibernate. The temp. of the vivarium is 19°C.

Oct. 15 John Minnich brought me a juvenile today that he caught south of Rumorosa, Baja Calif. last Saturday. This animal has been added to the group in the vivarium.

Nov. 14 An adult ♂ we captured 10 miles S. of Rumorosa, Baja Calif., Mexico on April 23, 1961 died yesterday in the cold room. It wasn't placed in the cold room last winter to hibernate. However, I placed all the rest of my *Phrynosoma* in the cold room this fall (Oct. 9, 1962), so I put this one in with the rest. This animal was in excellent shape when placed in the cold room. The temperature in the vivarium is 19°C. I don't know whether the low temperature or some other factor caused its death.

1963 UCR, Riverside Co., Calif.

Aug. 2 Ray, our janitor, brought in a newly hatched lizard that his son found this

Mayhew
1963

Phrynosoma coronatum

3.

Aug. 2. UCR, Riverside Co., Calif.

morning. The animal measured 23 mm (S-V length.

Oct. 9 Ray, the custodian brought in a young lizard (♀) his son caught yesterday. It measured 37 mm (S-V).

Phrynosoma
m'calli

Phrynosoma m'calli

Mayhew
1957

Mar. 31 Salton Sea, Imperial Co., Calif.

One was collected on the sand in the bottom of a wash about 1 mile north of San Felipe Creek and about 5 miles west of highway 99.

1958
Aug. 24 Salton Sea area, Imperial-San Diego Co., Calif.

This morning 2 young of the year were picked up at the edge of the road about 20 feet apart at 0800. This was along the road from Ocotillo Wells to Split Mountain, San Diego Co. No other ones were seen. They are quite young, since the umbilical opening is still visible.

Sept. 20 3 mi. S. of Ocotillo Wells, San Diego Co., Calif.

Between 0730 and 0915 five juvenals were captured on one short stretch of road about 3 miles in length. The first 3 were caught quite close together, when the air temp. was 31.9°C. and the soil temp. was 34°C. A short time later 2 more were captured rather close to where the other 3 had been taken. When we left at 0915, air temp. was 36.7°C., soil surface temp. was 48.2°C.

1959
Apr. 25 8 mi. W. of Glamis, Imperial Co., Calif.

An adult ♀ was captured at 0915 this morning. It was found

Mayhew
1959

Apr. 25 8 mi. W. of Glamis, Imperial Co., Calif.

in a reasonably sandy creosote bush scrub area west of the canal at the western edge of the Algodones Dunes. It was resting on the sand about 4 feet from the middle of the creosote bush in which we were searching for lizards. It made no move until we stepped within 3 feet of it. Then it made a mad dash for a hole at the base of the same creosote bush. After we had dug at the base of this plant for several minutes, I saw the animal on the surface near one of the larger stems of the plant. It was completely motionless until we reached for it. Apparently it had emerged from one of the other openings to that particular burrow system when we had disturbed it with our digging.

May 23 2 mi. N. of Indio, Riverside Co., Calif.

This evening at dusk (1910), a ♂, nearly adult, ran across the road in front of the car on the power line road, 1 mile west of its junction with Dillon Road. It stopped on the sand about 2 feet from the edge of the road.

July 20 1 mi. W. of 1000 Palms, Riverside Co., Calif.

An adult ♂ was found sitting on the road about one hour after sunrise today,

July 21 5 mi. W. of Glamis, Imperial Co., Calif.

An adult ♂ was picked up in the road this afternoon. The air and soil temps. were still quite high (see collection sheet) when he was found.

July 22 Two animals were found on the oil at the edge of the road this morning. Both of them were seen quite easily. In this area, these animals seem to be more abundant than Phrynosoma platyrhinos.

Oct. 14 Between aug 9. and now 12 immature animals have been caught near here and returned to our lab. at UCR for growth data. They are being kept in terraria inside the lab. Heat is supplied them by infra-red heat lamps.

Dec. 6 One animal died today, and some others don't look too spry. These animals have nearly all stopped eating, even though they are heated up each day with lamps. Therefore, we are turning off the lights tomorrow, & leave them off for a month or so.

Dec. 15 It appears that a vitamin D deficiency may be responsible for our lizard deaths (Phrynosoma and other genera). Therefore, we are going to treat all our animals with about 1/2 hour of ultra-violet each day. The animals have developed convulsions and paralysis that appears to be due to a calcium deficiency.

Jan. 4 UCR campus, Riverside Co., Calif.

The infra-red heat lamps again are turned on the six animals we have left each day from 8AM to 5PM. The ultra-violet lamp is turned on them about 1/2 hour each day as well. Two of the animals appear to be near death, but the other 4 seem to be in fine shape.

Jan. 10 The four remaining animals still seem in very good shape. all four ate for the first time this morning. They seem to be losing their lethargic reactions that were noted the past month or so. They act as though spring is here.

Feb. 2 Glamis area, Imperial Co., Calif.

A juvenal animal (42 mm. in its squashed condition) was found on the road tonight between the two canals where it had been run over by a car today.

May 13 Four dead animals were found between the 2 canals on one pass this afternoon. Only one of them could be salvaged for our work. In addition, 2 live ones were seen and collected.

May 14 We passed between the canals at approximately the same time today as yesterday (1500 to 1600), but we didn't see a trace (live or dead) of any of these animals.

June 24 West of Glamis, Imperial Co., Calif.

This morning Ed Eberle, Bill Truesdall, Ray Folmar, Francis Shropshire, Dianne Paschall, & Donna Hobbs caught 5 animals between the Highline & Coachella Canals west of Glamis. This afternoon they caught 2 more, making 7 for the day:

animal no.	Time	air temp. (°C.)	substrate temp. (°C.)
1	0715	38.3	39.5
2	0725	38.5	39.5
3	0730	38.5	39.5
4	0815	38.0	39.0
5	0822	39.0	39.5
6	1740	40.0	43.5
7	1750	40.0	43.0

June 25 Fourteen more were caught this morning, as follows:

animal no.	Time	air temp. (°C.)	substrate temp. (°C.)
1	0640	33.0	34.0
2	0645	34.0	35.5
3	0650	34.0	35.5
4	0650	35.0	36.0
5	0700	36.0	37.5
6	0705	36.0	37.5
7	0715	36.0	37.5
8	0725	36.0	38.0
9	0730	36.0	39.0
10	0735	36.0	39.0
11	0736	36.0	38.5
12	0750	36.5	41.0
13	0755	36.5	40.5
14	0820	37.0	40.5

Mayhew
1961

Phrynosoma m'calli

July 3

UCR, Riverside Co., Calif.

Today I toe-clipped the following animals & placed them in cages 1, 3, & 4 for some temperature experiments.

animal #	Sex	s-v length	cage #	Recorder #
3	♀	72	4	1 (3) D.V.
4	♂	76	4	1
5	♂	70	4	1
6	♂	66	3	2
7	♀	59	4	1
8	♀	76	1	3
9	♀	72	1	3
10	♂	69	1	3
11	♀	68	3	2
12	♂	69	1	3
13	♀	65	4	1
0	♀	72	1	3 (left front foot missing)
1	♀	57	3	2
2	♂	60	3	2

#1 & 2 were already in cage #3. We will be using the Brown recorder (3 channel) that Bob Lasiewski brought from Univ. of Michigan. This puts 2 ♂ in each cage, 3 ♀ in cages 1 & 4, & 2 ♀ in cage 3. These animals are part of the 21 animals caught June 24 & 25 west of Glamis by Ed Eberle, Bill Truesdell, etc. They caught 14 in one pass between the canals on the morning of June 25! (Two dead animals of this species also were seen during that trip.)

Mayhew
1961

July 27 UCR, Riverside Co., Calif.

For the past couple of weeks a Brown recorder has been used to record temps. of some of these animals. The lights in the cages come on at 0710 and go off at 1820. The animals have been in cages #1, 2, & 3, but recorder numbers were in reverse order (cage 1, recorder 3, cage 2, recorder 2, cage 3, recorder 1). at 1800 the maximum & minimum temps. (substrata) were as follows:

cage #	Max. temp.	min. temp.
1	64.5	31.5
2	75.0	32.0
3	56.0	37.2

Cage 1 has 2 heat lamps at one end, as does cage 2. Cage 3 has 1 heat lamp at each end.

Dave Young also took maximum & minimum temps. in the same cages on 7/21/61. His records at 1630:

cage #	Max. temp.	min. temp.
1	68.5	33.4
2	54.0	31.0
3	57.0	38.0

Aug. 20 One of the ♀ that has been held in a special aquarium laid 5 # eggs while no one was around, probably yesterday (Saturday). They were nearly completely dessicated when I found

Aug. 20 UCR, Riverside Co., Calif.

them this afternoon. None of them had been buried in the damp sand in one end of the terrarium that had been placed there especially for that purpose. Rather, they were scattered throughout the terrarium on top of the sand. A few minutes later I found one that had been buried in the sand. All 5 were placed in damp sand in a finger bowl, since an embryo could be seen in several of the eggs.

Aug. 22 Glamis area, Imperial Co., Calif.

We captured 8 more animals this trip (4 adults, 4 juvenals) in spite of the rainy weather & the gravel trucks. Several were caught while it was gently sprinkling. One DOR also was found on the road. We now have caught or seen DOR 150 animals on the 7 mile stretch between the canals this year (121 live, 29 DOR), 114 of which have been seen the last 3 months - June, July, & Aug. (102 live, 12 DOR).

Aug. 24 UCR, Riverside Co., Calif.

Ed Eberle's lizard #8 laid 9 eggs today. All of them were fertile with nice red blastodiscs. No dessication

Aug. 24 UCR, Riverside Co., Calif
had set in before Walt Moberly found them. They are being incubated in moist sand in a finger bowl. They measured:

17.7 x 10.3 mm.
16.7 x 10.6 "
15.7 x 11.1 "
14.7 x 10.9 "
16.3 x 10.5 "
16.7 x 11.5 "
15.1 x 11.5 "
17.1 x 11.0 "
15.9 x 11.9 "

They are presently under a goose-neck lamp to keep them heated.

Aug. 29 Ed's ♀ that is missing the left front foot laid 5 eggs today. They were quite dessicated when Donna Hobbs found them. However, I set them in a shallow container of water.

Aug. 30 The eggs in the water had absorbed a fair amount of moisture, so I measured them & placed them in a finger bowl between 2 layers of moist cotton. Their measurements are:

18.0 x 11.3 mm.
19.6 x 12.3 "
18.2 x 12.4 "
18.1 x 12.1 "
18.2 x 11.0 "

Embryos were visible in each.

Aug. 30

UCR, Riverside Co., Calif.

I checked the eggs in sand & found them to be in rather bad shape. They had become somewhat dessicated, so I changed them to cotton also.

All the live animals of mine were divided into 2 groups today for the hibernation experiment I plan to conduct this winter. The animals that were placed in cage # 2 (on the table) will continue to be exposed to light as they have been this summer (since each was captured). Those in cage # 4 (under the table) will have the lights turned off all winter. Two adults and 8 juvenals are in each cage, as follows:

cage 2			cage 4		
no.	age	sex	no.	age	sex
17	ad.	♀	19	ad.	♀
[redacted]3	ad.	♀	20	ad.	♂
1	juv.	♀	23	juv.	♀
2	juv.	♂	6	juv.	♂
4	juv.	♀	7	juv.	♀
5	juv.	♂	8	juv.	♂
10	juv.	♂	9	juv.	♀
14	juv.	♀	11	juv.	♀
15	juv.	♀	12	juv.	♂
16	juv.	♂	13	juv.	♀

More may be added next month if we can catch any more.

Sept. 13 Glamis area, Imperial Co., Calif.

We have captured 13 animals in the past 3 days (6 adult, 7 immature). No dead ones were seen on the road at any time. Now we have collected or seen DOR 163 animals since the first of the year (134 live, 29 DOR), and 127 since June 1st (115 live, 12 DOR), between the Highline & Coachella Canals.

Sept. 14 UCR, Riverside Co., Calif.

Animals numbered 24, 25, and 26 (all juvenals) were added to cage # 2 (on table), while animals numbered 18, 21, and 22 were added to cage # 4 (beneath table).

Sept. 21 All the animals that had been in cage # 4 have now been moved to cage # 1.

Oct. 2 When I entered the office at 1515, I saw 2 freshly laid eggs on the surface of the sand in cage # 1. Only one adult ♀ (No. 19) is in that cage, so I knew she must have laid the eggs. These eggs were near the glass next to the walk-way, & about ½ way from each end of the cage. At 1530 I found another freshly laid egg in the same general location. At 1535 I found 2 more eggs — one on the opposite side of the cage from the earlier ones, but in

Oct. 2

UCR, Riverside Co., Calif.

in same general position in regards to the length of the cage. The 5th egg was also on the opposite side of the cage, but near one end (about the hottest spot in the cage). None of the eggs were buried. All contained a well-defined blastodisc. The measurements of the eggs and blastodiscs are:

egg		blastodisc
21.3 X 11.1 mm.	→	9.0 X 7.8 mm.
20.4 X 11.3 "	→	10.0 X 7.1 "
20.6 X 11.0 "	→	9.0 X 8.7 "
20.0 X 11.0 "	→	9.6 X 8.0 "
20.6 X 11.0 "	→	9.2 X 7.0 "

All of these eggs had just been laid before I found them, so they were in excellent condition. They have been set on moist absorbent cotton in a plastic bag & the bag is sealed with a rubber band (after Zweifel, Copeia, 1961 (1) 112-113).

The ♀ that laid the eggs was captured 13 mi. W. of Glamis, Imperial Co., Calif. on Aug. 22, 1961. She has been in a 6-foot cage with 1 adult ♂ (#20) and 11 juvenals of this species. Since 2 of the 3 adult ♀ dissected in September contained eggs in the oviduct, this may be a typical condition for this species.

Oct. 6 UCR, Riverside Co., Calif

Today the lights in cage #1 were turned off for the remainder of the winter. The lights in cage #2 will remain on for 11 hours each day as in the past.

Oct. 7 Glamis area, Imperial Co., Calif.

Walt Moberly & Ed Eberle drove the road between the canals while Bill Truesdell & I worked the dunes. They covered the road from 0735 to 1045. They caught the first animal at 0900; captured 5 in all. No dead ones were seen. We have now collected (or seen DOR) 165 animals on this stretch of road since the first of the year (136 alive, 29 DOR), 132 since June 1st (120 alive, 12 DOR).

Oct. 8 The 4 of us drove the road between the canals once today. It was so cold & windy that we were sure no animals would be on the road. So, we took our time starting to look along the road, weighing & measuring Uma notata instead. Thus, we looked for this species from 1200 to 1230, & as we expected, we found none of them along the road. The sky was 100% overcast at the time, and the maximum temperature today (while looking for these animals) was 20.0°C.

Oct. 9 UCR, Riverside Co., Calif.

The eggs that have been incubating in lab. look pretty bad now. All but one are quite turgid, but mold has started to develop on them. Moisture has condensed on the plastic bag, so the air inside is saturated. I am going to keep them a while longer.

Oct. 13 The animals in cage #1 with the lights off were not going into hibernation as I had hoped, apparently because the room remains too warm. Sand temperatures in the cage range from 29.0°C at the surface to 31.0°C next to the bottom of the cage (lights on the cage beneath the table 24 hrs./day). Although some of the younger animals have been rather inactive since about Oct. 1st, none of them could really be considered hibernating. (All of the lizards in cage #2 are still active). Consequently I took all of the animals in cage #1 & placed them in a 15 gallon aquarium in the cold room (15°C.) today. Three of the young ones appeared to be developing the eye trouble we have found in so many of our lizards, so I treated their eyes with Aureomycin ointment.

Oct. 16 UCR, Riverside Co., Calif.

Three of the young animals in cage #2 have become very inactive the last couple of days. Today it has become quite obvious.

Oct. 25 This morning at feeding time, when nearly all the animals normally are active, only 2 immatures & the 2 adults were active. The remainder simply remained in or on the sand. The animals in the cold room were checked. They are all still alive, but very sluggish. Only 1 of the adults appeared to be at all active. None of the young have buried themselves completely beneath the sand in the cold room. Most of them are standing stiff-legged with their bellies above the sand, but their heads bowed so far that most are touching the sand.

The 3 eggs that remain under incubation in the plastic bag are completely covered with mold. However, all of them are as turgid as at the beginning of incubation. Moisture is still condensed over the inner surface of the bag. The mold over the eggs is white, whereas that on the cotton nest in which they are resting is black.

Oct. 26 Only the 2 adults and 3 of the young were active at feeding time this morning.

Oct. 30 UCR, Riverside Co., Calif.

Three young & both adults appear to be active at times yet in the light cage. There seems to be little or no activity in the cold room cage.

Nov. 3 None of these animals in the laboratory show any appreciable appetite any longer. One or 2 animals may eat 1 or 2 worms apiece, but none of them eat several worms at a time as they have in the past. This is in contrast to the 3 species of Uma and Dipsosaurus dorsalis that are being held under similar conditions in cages beside them.

Nov. 13 Four of the young animals in the cold room were found dead this afternoon. The rest appear to be in reasonably good shape.

Nov. 14 I weighed & measured both adults and as many young as were above the sand surface this morning. Both adults are doing fine. One young animal (#16) hasn't been seen to go under the sand for several days. It is not in very good shape. The other 3 young (#15, 25, 26), however, seemed to be in fine shape. Others will be checked if they emerge from the sand on their own.

Nov. 20 UCR, Riverside Co., Calif.

Ed Eberle brought in 2 of his ♀ that had just died. One was from his 8-hours of light cage, & the other was from his 24-hour cage. The one from the 8-hour cage contained 8 eggs in each ovary. (1E) (74 mm) The largest in the left ovary was 7.5 mm, & there were 3 enlarged eggs in that ovary. There were also 3 enlarged eggs in the right ovary, the largest of which was 6.5 mm. The ♀ from the 24-hour cage contained 6 eggs (2E) (71 mm) in the oviduct — 3 on each side of the body. These were somewhat dessicated, so measurements don't mean much. However, they appeared to be of normal size for the species. These animals have been on the experimental light cycles for the past 8 weeks (250 watt infra-red heat lamps).

Nov. 30 None of the young animals eat any longer, or if one happens to, it takes only one worm. The adults rarely eat more than one worm at a feeding now, although earlier they would consume as many as a dozen at one feeding. The animals in the cold room now seem to be hibernating. Even the adults keep their eyes tightly closed when I inspect them. This has been true for only the past week. The adults are partially buried in sand

Nov. 30 UCR, Riverside Co., Calif.

now. (The adult *P. platyrhinos* has been in this condition for several weeks.) Most of the young animals appear to be in fine shape yet. They don't move about much. One was seen to walk clumsily a few inches this morning. The others remain so inactive one wonders whether they are alive or not. However, when turned over on their backs, they readily right themselves.

Dec. 13 The remaining ♀ Ed Eberle had in his 24-hour light cage laid 5 eggs this morning. They were quite dessicated by the time they were found (0800) because they had been laid on the sand surface beneath the light. This animal was captured June 25, 1961, and has been on 24 hours of light per day since October 8, 1961.

The animals in my 11 hour cage are behaving somewhat differently, depending on their age. The young ones are very inactive now. One, or at the most, two may move about a bit sometime during the day, but this movement will be very brief. Most of their time is spent under the sand, or lying prone on top of the sand. Those

Dec. 13 UCR, Riverside Co., Calif.

on the surface are turned over on their backs every few days to see if they are still alive. They right themselves immediately, then close their eyes & return to their original position. The adults, on the other hand, are active for brief periods each day. They still eat a few mealworms, whereas the young refuse food. The animals in the cold room are all hibernating now. Both young and adults shift position on the sand surface occasionally, but none of them have their eyes open any longer. They are all resting on the sand surface most of the time, although some of the young still stand on extended legs for brief periods. None of the cold room lizards have eaten since they were placed in the cold room because they haven't been offered any food. However, it is obvious they would not eat now.

1962

Jan. 10 UCR, Riverside Co., Calif.

Ed Eberle brought in a dead ♂ this afternoon. It had died today. It had been in the 24-hour light cage. It measured 77 mm (S-V). The testes were flaccid, much as they appear at the end

Jan. 10 UCR, Riverside Co., Calif.

of the breeding season. They measured 5.3 X 2.3 mm. and 5.4 X 2.0 mm. (left + right respectively). The epididymis was
(3 E) convoluted + easily observed beside each testis, but the vas deferens was clear and difficult to locate. The hemipenes were enlarged. It contained very large fat bodies (2.4 gms. combined). This animal was captured June 25, 1961, and has been under 24 hours of light per day since October 8, 1961.

Jan. 23 The 2 surviving lizards from the cold room were returned to the hot cage in the lab today. They have been in a cage at room temperature (~25°C) since Jan. 19th.

Feb. 8 All the adults have become much more active the past few days. They are spending more time above the sand surface, and are more active when they are above ground. They are also eating considerably more than they have all winter. One of the adults that was in the hot cage all winter is having eye trouble, so I am treating it with aureomycin. The young animal that was kept in the cold room is behaving much like the adults. It is eating quite

Feb. 8 UCR, Riverside Co., Calif.

regularly again. The young ones that remained in the hot cage all winter, however, still are very inactive. Even when they surface, they rarely eat.

Feb. 14 The two adults that remained in the hot cage all winter are beginning to appear bedraggled. They are quite inactive most of the time. Even when they are above ground, they keep their eyes closed most of the time. The adult that was kept in the cold room during the winter, on the other hand, is active and alert as any animal we have seen in the field. The young animal from the cold room also is still more active than those maintained in the hot cage.

Feb. 27 Walt brought in an adult ♂ that had been overlooked in the outdoor cage last fall (#6). It was on the surface of the sand when he found it at 0930. Its cloacal temp. was 9.0°C. One eye is shut and there is lots of dirt around its mouth. This lizard measured 66 mm (S-V) when placed in the outdoor cage last July 27th. It now measures 69 mm (S-V). The closed eye was open

Feb. 27 UCR campus, Riverside Co., Calif.
when I looked at him at 0950. He seems to be in fine shape. He is quite fat. The period of hibernation apparently requires very little energy for the entire time. He has been left primarily to his own devices for the past 7 months. Food was placed in the cage through September, but nothing has been done out there since that time.

Apr. 14 Glamis area, Imperial Co., Calif.
Animals still seem to be abundant between the canals. One car was on the road from 0700 to 1100, + from 1630 to sundown (1807) today. A total of 22 animals were collected along the road (2 ad ♂, 3 ad ♀, 1 ad? ♂, 4 ad? ♀, 5 im ♂, 7 im ♀). Also, 3 DOR were seen on the road.

May 13 A ♂ DOR (80 mm S-V) was found 9 mi. W. of Glamis. Its testes had already deteriorated to the point they were just two masses of jello. However, I could determine that it was (4) and (8) on our code. In all, 5 DOR were seen on this trip (1 on May 12, 4 on May 13). Two of these I was able to salvage. The rest were beyond hope for any data.

Mayhew
1962

May 13 Glamis area, Imperial Co., Calif.

In addition, 14 live animals were captured, 3 of which were toe-clipped + released (immature). Thus, we have captured 36 live lizards + we picked up 8 DOR this spring in this area (no checking here until April 14). Three of the live ones were released.

June 7 UCR, Riverside Co., Calif.

Seven young animals are being held in a cage 4'x2' that is heated by one 250-watt infra-red heat lamp. The light is ~~on~~ for 11 hours each day. Soil surface temperatures in the cage are as follows:

28.8				26.8
	28.4		27.5	
29.0		28.0		26.8
	28.0		27.4	
28.8			27.0	26.8

0700 (no light for approx. 13 hours previously)

Range – 26.8° to 29.0°C.

35.0	35.0		50.0	35.0
33.6		40.2	58.5	37.5
	35.5			
			57.5	
34.6				36.8

1600 (light for approx. 9 hours)

Range – 33.6° to 58.5°C.

The air temperatures at 1 centimeter above the soil surface in the cage are as follows:

Mayhew 1962

Phrynosoma m'calli

June 7

UCR, Riverside Co., Calif.

0700

27.0			27.0	27.0
	27.0			
27.0		27.0	27.0	27.0
	27.0			
27.0			27.0	27.0

Range – 27.0°C.

1600

33.0			37.4	33.2
	32.6			
32.8		34.2	44.2	33.8
	32.4			
			39.0	
32.8				33.8

Range – 32.4° to 44.2°C.

At 1615 the cloacal temp. of 2 animals on the surface were: #1 – 37.0°C; #4 – 37.0°C.

June 8

Time	animal #	Cloacal Temp. (°C)	Remarks
1600	1	37.2	no chase
	6	36.6	" "
	3	38.5	" "
	4	35.0	" "
	5	34.0	all but head buried

June 12 1 DOR ♀ seen while night collecting near Glamis.

June 13

Glamis area, Imperial Co., Calif.

We began looking for animals along the road between the canals at 0610. However, we made one pass and part of another one before we saw any lizards. The first animal was seen at 0800, when air temp (1cm) was 30.6°C, asphalt temp. at edge of road was 37.6°C. We saw several

June 13

Glamis area, Imperial Co., Calif.

lizards in quick succession after that. During that pass we caught 8 animals, saw one other that escaped us, and found 2 DOR. The return pass yielded only 2 animals. The last one was found at 0955 when air temp. (1 cm) was 37.6°C. and asphalt temp. was 45.9°C.

The wind began blowing quite hard early in the afternoon, so we didn't expect to find any animals out. However, we decided to make one pass through the area, even though the wind was blowing hard enough to move sand across the road. The pass was made between 1615 and 1710. One animal was found on this pass (at 1645). The wind was estimated to be about 15 miles per hour.

Since April 14 we have captured 47 live animals and found 11 DOR between the canals west of Glamis. This trip all the animals captured were adults. None of the small ones seen during earlier trips were found, except for one of the DOR's. Since Feb. 2, 1961 we have captured 183 live ones, found 40 DOR's, for a total of 223.

July 20 Glamis, Imperial Co., Calif.

Today we caught 5 live lizards & found 1 DOR. The DOR was the first juvenile animal we have seen this year.

July 21 We caught 6 live lizards & saw 5 DOR this morning. One captured lizard & one DOR were juveniles. The sky was completely overcast today, & the humidity was quite high. We looked for lizards from 0655 to 1125, but we found animals only from 0735 to 1015. Since April 14 this year we have captured 58 animals and seen 17 DOR for a total of 75 lizards. Since Feb. 2, 1961 we have captured 194 lizards, and seen 46 DOR for a total of 240 lizards along this 7-mile stretch of road (between the Coachella & Highline Canals). Today we found the first young of the year we have seen so far.

Aug 4-5 We made one complete round on the road Saturday, and one pass as we left the area Sunday. We caught 6 ad ♂, 6 ad ♀, and 6 juveniles during this time. We also saw 7 DOR's (3 on 4th; 4 on the 5th). We now have caught 76 live ones since April 14, 1962, and seen 24 DOR's, for a total of 100 lizards this year. Our totals

Aug 4-5 Glamis area, Imperial Co., Calif.
since Feb. 2, 1961 are: live - 212; DOR's - 53; total - 265 lizards.

Aug 10-12 During this 3-day period we captured only 13 animals (2 ad ♀, 11 juv). Only 3 DOR's (all adult) were seen during the same period. We made 1 pass Aug. 10-PM, 3 passes Aug. 11-AM, and 1 pass Aug 12-AM. Since April 14, 1962 we have captured 89 live ones, seen 27 DOR's, for a total of 116 lizards; since Feb. 2, 1961 we have seen or caught: live - 225; DOR - 56; total - 281.

Aug. 13 Four juveniles (2♂, 2♀) were added to the cage that contains the 4 immatures. These animals are now being supplied with some black harvester ants (*Veromessor pergandei*) to supplement their mealworm diet.

Aug. 14 Today Ken Evans gave me some reproductive data from one of the lizards we caught June 13, 1962 west of Glamis. "On August 9, 1962 a gravid ♀ weighing 18.9 gms. was placed in a substratum thermal gradient. She was removed on August 12, 1962, after her eggs had been laid, and now she weighed 13.9 gms. The eggs were found by raking through the sand with my fingers. One was on the surface of area #2, in

Aug. 14 | UCR, Riverside Co., Calif.
which the sand temperature varies from 44 to 47.5°C. Five other eggs were found under a narrow strip of plywood that serves as a boundary between areas #2 and 3 in the gradient. The sand temperature in area #3 varies from 39 to 42.5°C. The hottest area in the gradient varies from 46.5 to 51°C. The coldest is a nearly constant 16°C. The eggs were all shrivelled when I found them." This animal measured 68 mm S-V (#203).

Aug. 20 | Donna Hobb's juvenal (♀) measured 35 mm (S-V) & weighed 2.0 gms. today. It measured 35 mm. & weighed 1.5 gms. when obtained Aug. 4, 1962.

Sept. 14 | Glamis, Imperial Co., Calif.
We reached this area after dark this evening. However, we found one DOR (juvenile) as we looked for Coleonyx variegatus.

Sept. 15 | We drove the road between the canals from 0715 to 0940 (one round trip). We found 3 live (2 ad. ♀, 1 juv. ♀) and 2 DOR animals (1 juv., 1 ad.).

Sept. 16 | We looked for DOR animals as we left the area at 1130 today. One juvenile DOR was all that was seen. Thus, we found 3 live and 4 DOR on this trip. Since April 14, 1962

Sept. 16 Glamis, Imperial Co., Calif.
we have found 92 live and 31 DOR animals, for a total of 123. Since Feb. 2, 1961 (the year we began an intensive search for these lizards in this location) we have found 228 live and 60 DOR animals, for a total of 288 lizards of this species along a 7-mile stretch of pavement.

Sept. 17 UCR, Riverside Co., Calif.
The 8 captive lizards were weighed today for the September measurements. all but one animal have gained considerably in weight (and most also have in length) since the August weighing. This was the greatest increase any of them have made since they have been in captivity, even though 1/2 of them have been in captivity since last Spring (April).

Sept. 19 Today I totaled the number of lizards of this species obtained since the beginning of the reptile project (July, 1958). Some were live, some DOR; some were collected & dissected, some were measured & released. Nevertheless, some data were obtained from each of these:

Live	DOR	Total (to 9/19/62)
280	60	340

Mayhew
1962

Phrynosoma m'calli

Sept. 19 UCR, Riverside Co., Calif.

The 31 DOR were seen during the 16 days this year we drove the road between the canals near Glamis looking for this species. Thus, we saw an average of 1.9 DOR per day during the year. These lizards were known to be active this year from March 25 to September 16, and were undoubtedly active before and after these dates. Nevertheless, these dates cover 176 days, which means that conservatively, 334 DOR's were produced along that 7-mile stretch of road during 1962. During 1961, 29 DOR's were seen on the same road during 21 days' looking for P. m'calli, for an average of 1.4 DOR per day. These lizards were seen on the road from Feb. 2 to October 7 (248 days). Not all DOR's were recorded early in the season, so I'm sure the figure for 1961 is also a conservative one. At any rate, 1.4 DOR per day for 248 days gives 347 DOR produced on this road in 1961. Thus, 681 DOR (at least) probably were produced during this 2-year period. Combining the figures for the 2 years (60 DOR seen on 37 days) gives 1.6 DOR per day, or 678 DOR's on 424 days.

Oct. 5 UCR, Riverside Co., Calif.

The 2 animals of Ken Evans that are still alive I placed in a terrarium in the vivarium this afternoon. The male eats by itself now, but the female was force-fed the last few times it ate. The temp. (air + soil) in the vivarium is 20 °C. (Animals caught last June.)

Oct. 9 This morning I took my 8 lizards (4 caught in April as young, 4 caught this August as young) and placed them in another terrarium in the vivarium. Few of them are eating very much, and none of them spend much time on the surface. Therefore, it appears it is time to let them hibernate. They have about 4 inches of sand in which to bury.

Oct. 18 Sarojam Mankau told me today that the parasitized livers of this species that I gave her students contained tapeworm larvae only. However, it hasn't been possible to identify them beyond this point. Since the host for the adult is unknown, it is difficult to get these parasites to mature so they can be identified. The same kind of tapeworm was found in the livers of all the species I gave them with infected livers.

Mayhew
1962

Oct. 29 UCR, Riverside Co., Calif.

This morning 8 of the 9 animals in the vivarium were above the sand. Some had their eyes closed, but several seemed to be alert. approximately the same number were on top of the sand when I looked last Friday (Oct. 26).

Nov. 8 This morning 8 of the 9 animals in the vivarium were above the sand, as before, some had their eyes closed, but several seemed to be alert.

Nov. 14 a juvenile ♂ (#10) was found dead in the cage in the vivarium this morning. It appeared to have been dead a couple of days. a large P. coronatum was lying on the head of #10, which may have caused its death. The remainder of P. m'calli in the cage seem to be getting along all right. Six of them were on the sand surface, but only a couple of them had their eyes open.

Dec. 5 #204, one given me by Ken Evans, was found dead today. It appeared to have been dead for approximately a week. Several of the other lizards are out of the sand and standing with their bodies well above the sand. Some have their eyes open and some have their eyes closed.

Mayhew
1962

Dec. 14 U C R, Riverside Co., Calif.

This morning 3 more lizards were dead in the vivarium (# 3, 5, 7). The remaining 4 (# 4, 6, 8, 9) were returned to the laboratory and placed in the cage in which they spent the summer. However, the lights will not be turned on for at least another month. The temperature of both air (1 cm) and soil surface in the cage was 26.2°C. at the time the animals were returned. The two largest animals (live) had their mouths partly opened and the tip of the tongue was protruding. This is the way I have found most of the dead animals in the vivarium. The live animals looked entirely natural again, however, a short time after being returned to the laboratory. All 4 animals have moved about the cage a bit, and appear to be quite alert, even though they were all in a resting condition in the vivarium when I first saw them this morning. The two smaller animals appear to be in fine condition yet. Several scats were visible in the vivarium cage, even though these animals haven't eaten since being placed in the vivarium.

Mayhew
1963

Phrynosoma m'calli

Jan. 21 UCR, Riverside Co., Calif.

One of the young animals in the lab. is beginning to become more active. It was out on the surface with its eyes open last Friday (Jan. 18), and was out the same way this morning. All the remaining animals are still very much out of it yet.

Jan. 22 The same young animal (No. 8 - ♀) was on the surface again this morning, so I put it in cage # 3 with a heat lamp turned on at one end, I offered it a mealworm, which it ate. Then it ate a second one, but ignored a third one. I put it in the cool end of the cage, but it soon made its way to the warm end & sat at about the hottest spot. None of the other animals are the least bit active in cage # 2 (the cold cage).

This afternoon # 9 (♂) was also moved to cage # 3, since it was on top of the sand with its eyes open. These two animals are the smallest of this species in the lab, # 6, which was twice as large, died today. Only # 4 is still in cage # 2. It moves its head a bit, but that is all. Lynette Rath, a graduate student at San Diego State, told me today she saw a juvenile

Jan. 22 UCR, Riverside Co., Calif.

on the road west of Glamis in December. The car just in front of hers ran over it.

Jan. 23 #4 was found dead in cage #2 this morning. The only ones left are the 2 small ones in cage #3. Tremendous fat bodies were present in both the dead animals, so it wasn't a matter of starving to death.

Feb. 8 This afternoon #8 was dead at the hot end of the cage. It had refused to eat anything since it took two mealworms on Jan. 22. It has moved about in the cage a bit each day, but spent most of its time beneath the sand, or resting on the sand with its eyes closed. It had not been really alert and active since Jan. 22.

Mar. 16 Glamis area, Imperial Co., Calif.

We looked between the canals from 0855 until 1345 today without seeing a live P. m'calli. However, 2 DOR were found (31 miles). The sky was overcast (100%) most of the time, & the air temp. was quite cool (approx. 17°C). Apparently, however, the animals had been active in rather large numbers earlier. Lynette Rath, from San Diego State, was also looking for them

Mar. 16 | Glamis area, Imperial Co., Calif.

this week-end. She showed me temp. data she had acquired from some animals she had captured earlier in the year (she has been down there every week-end since the 1st of February). She captured 15 on 3 February, which happened to be a very warm week-end. She had obtained an addition 1/2 dozen or so on 5 February & again on 24 February. She did not catch any this week-end, however.

April 5 | We made one pass between the canals today — 1445 to 1515. No live ones were seen, but we found 3 DOR. The air temp. at the time of the pass was 90°F.

April 6 | Highway 2, E. of San Luis, R.C., Sonora, Mexico

This morning between 0900 and 1200 we drove the first 10 miles east of town. No m'calli were seen at all until 1135. Then we saw 3 DOR and 1 live one within a couple of hundred yards. No others were seen. The substrate looked good for this species, but they certainly were not to be seen. An awful lot of cars used this road today. All animals seen were observed 7 mi. E. of San Luis.

April 7 | Glamis area, Imperial Co., Calif.

We looked between the canals

April 7

Glamis area, Imperial Co., Calif.

from 1045 to 1730. During this period we found 11 live and 6 DOR animals. The sky was almost totally overcast until about 1530, when blue sky began to appear. The last 4 lizards were found by tracking them. Two of them were still on the surface, the other two already had buried for the day. One was buried near a Colderia plicata. The other was just under the sand's surface (two of its head spines were slightly above the surface) in the open. No plants were within 3 feet of it. The tracks appear like this :- . ·· . . ·· . . ·· . ··
A couple of them were tracked about 50 feet. This technique appears to have real possibilities, since none of these animals would have been seen by us simply by watching the pavement. We made 4 passes between the canals today (28 miles).

April 8

We looked from 0640 to 1110 today without success. One DOR was all that was seen, & it appeared as though it was one we should have seen yesterday. The weather was warm enough, especially after 0830, but the 15 mph. wind evidently was enough to keep them underground. We didn't try to find any in the after-

April 8 Glamis area, Imperial Co., Calif.

noon because the wind continued to blow for the remainder of the day.

April 28 Ken Evans & I made one pass between the canals between 1220 and 1730. We got out of the car periodically and tried to track the lizards. However, we were not very successful at this. We tracked one to its burial spot beneath a bush at 1700, but otherwise our tracking didn't yield any animals. Many P. m'calli tracks were seen — lots of them were rather fresh — but they seemed to vanish in thin air after one followed them for a while. These animals seem to move about a good deal. Some of the tracks were followed for 50-75 yards before they vanished. We also caught 3 others as they sat beside the road. In addition, 5 DOR's were seen on the road. One of these was in fairly good condition, so I saved it. The others were really flattened to the pavement. A large number of Sunday drivers were on the road today, which made road collecting rather hazardous. We saw Lynette Rath

April 28 | Glamis area, Imperial Co., Calif.

collecting in the area also. She now has collected 19 live P. m'calli here since the first of the year. She captured only 2 today. (Ed Eberle got 1 during Easter vacation, so at least 20 live ones have been removed in addition to the ones I have obtained.) I don't know why more of them weren't seen today because the weather is just about ideal—no wind or clouds, temp. today was 30.0°C. Even though the weather conditions were fairly mild today, no animals were seen during the middle of the day.

April 29 We drove the road between the canals today between 0740 and 1220. We caught 9 animals during this period, and saw 8 DOR's (none we could salvage). The gravel trucks, which were on the road in dozens today (at one time, 5 were in view at once), really flatten these animals when they run over them. The weather was a repeat of yesterday. Lots of animals were seen for a few minutes this morning (1000 to 1030) but few were seen at other

April 29 Glamis area, Imperial Co., Calif.

times. Most of the DOR's also were found about this time. So, for a complete day on the road (1220 to 1730 yesterday, 0740 to 1220 today), we found animals active from 0835 to 1125 and from 1440 to 1530. Most of the animals were found from 1000 to 1030. During this period, we caught 13 animals, and saw 13 DOR's. The DOR's were removed from the road each time we found one, so we were sure we didn't count any of them a second time. There apparently is a high mortality from the automobile and truck traffic.

So far this year I have acquired 24 live animals from this area, and seen 25 DOR's in 6 days of looking. Thus, we have averaged slightly over 4 DOR's per day.

May 24 Three of us looked for this species between the canals as we made a rather rapid pass through the area to get to the dunes. We looked from 1550 to 1620. One live animal and 6 DOR's were seen on this pass. While night collecting in the same area tonight we found an immature ♂ on the road at

May 24 — Glamis area, Imperial Co., Calif.

2125. We had passed that spot several times earlier that evening, so I feel quite certain this lizard had moved onto the road just a short time previous to our arrival on this pass.

May 25 (sundown — 1840)

We drove the road between the canals, looking for this species, from 0700 to 1230, then from 1500 to 1845. We did not look through the middle of the day because all *P. m'calli* had disappeared by 1105, and the temperature didn't cool sufficiently before 1500 for them to become active again. Consequently, on this particular day, these animals were active from 0700 to 1100, and from 1530 to 1730. However, they were most abundant from 0745 to 1000, and from 1600 to 1700. During the day we captured 27 live *P. m'calli* and saw 9 DOR's. These DOR's were not the same animals seen the day before, since I always make a point of removing each DOR *P. m'calli* from the road whenever I see one.

May 26

We looked for *P. m'calli* between the canals from 0840 to 1200. We found 10 live and 2 DOR's during

Mayhew
1963

May 26 Glamis area, Imperial Co., Calif.

this period. Two other cars were also carrying people looking for this species. Lyn Rath, from San Diego State, captured 13 today, & two fellows from Glendora caught 5. Thus, 28 live m'calli were caught on this stretch of road today that I know about. Our earliest capture today was at 0915, and the last one was caught at 1055. During this trip, we captured 39 lizards of this species, and found 17 DOR, for a total of 56 lizards. However, counting the other lizards that I know were captured during the same period, a total of 57 live and 17 DOR (no DOR records for the others) were captured or seen — total: 74 P. m'calli. This was the largest "take" on record for a single week-end to my knowledge, and occurred after two years of intensive collecting along this road. I am convinced that P. m'calli is the most abundant reptilian species that occurs in the creosote bush scrub between the two canals. A few Dipsosaurus dorsalis, Callisaurus draconoides, Uma notata, Crotaphytus

May 26

Glamis area, Imperial Co., Calif.
wislizeni, Cnemidophorus tigris, Uta stansburiana, Urosaurus graciosus are seen each trip, but none of them equal P. m'calli in numbers between the canals — at least along the road.

Two interesting observations were made this trip. This is the first time I have ever seen a P. m'calli east of the Coachella Canal in the Algodones Dunes. We found a DOR one night about 1 mile east of the canal. It was an immature (subadult) lizard. We have looked for them in that region many times in the past without success.

An adult ♀ was killed by a very large Crotaphytus wislizeni. The Crotaphytus was in the process of eating the horned lizard when I found them. The Crotaphytus was able to disgorge the head of the P. m'calli in spite of the horns on the back of its head. This is the only animal I have ever seen attempting to eat a P. m'calli.

The totals to date of this species collected (live) or seen (by me) (DOR) are

Mayhew
1963

May 26

Glamis area, Imperial Co., Calif.
as follows (from July 1958 thru May 1963):

Live	DOR	Total
343	102	445
Glamis area (1961-1962)		
228	60	288
Glamis area (1963-thru May)		
63	42	105
Glamis area (1961 thru May 1963)		
291	102	393

During 1963, 42 DOR's have been seen on 9 collecting days, for an average of 4.7 DOR's per day. Several of these days were on week-ends when traffic is not as heavy. A large number of big semi-trucks and trailers haul gravel over this road during the week from the gravel pits east of the dunes. Consequently, one would expect more DOR's on the days the gravel trucks are working than on the week-ends. Therefore, I feel the number of DOR's seen by us is a conservative estimate of the number of *P. m'calli* that are killed along this road each day. Fortunately, most of these animals spend their time on the shoulders of the road rather than on the road itself.

Phrynosoma m'calli

May 27 UCR, Riverside Co., Calif.

I now have 70 live lizards in my lab. that are being held for a hibernation experiment this winter. At present I have them divided as follows:

Cage #	# of lizards
2	12
3	16
4	18
5	12
6	12

June 7 Glamis area, Imperial Co., Calif.

We looked for lizards on one pass between the canals (1345 to 1545). We captured 9 live ones and saw 3 DOR's. (We captured 1 live one at Palm Springs Panorama on the way down.)

June 8 We looked between the canals from 0730 to 1130, then from 1245 to 1805. During this period we caught 27 live ones and saw 2 DOR's that were fresh (1 DOR ♂ measured 62mm S-V) We also found 2 DOR's that had been dead a long time.

June 9 We looked for lizards from 0715 to 1045. We collected 9 live ones and saw 3 DOR's. On the entire trip we caught 46 live ones and saw

Phrynosoma m'calli

June 9 **Glamis area, Imperial Co., Calif.**

8 DOR's. This brings our yearly total to 108 live and 52 DOR's (from the Glamis area), for a total of 160 lizards seen. During 1963, the 52 DOR's seen near Glamis were found during 12 days. Thus, we averaged 4.3 DOR's per day.

The totals to date of this species collected (live) or seen (DOR) by me are as follows:

All animals (from July 1958 thru June 1963)

Live	DOR	Total
389	112	501

Glamis area (1961-1962)

Live	DOR	Total
228	60	288

Glamis area (1963 - thru June)

Live	DOR	Total
108	52	160

Glamis area (1961 thru June 1963)

Live	DOR	Total
336	112	448

June 25 **UCR, Riverside Co., Calif.**

Today Shirley Hill found 8 eggs in lizard cage # 3 in the lab. There were 4 eggs in each clutch, which were deposited on the sand surface in different portions of the cage. One clutch was completely dehydrated when found, but the other clutch was in good shape. Shirley placed the good eggs in moist sand in

June 25 | UCR, Riverside Co., Calif.

a finger bowl. They are being held at room temperature in the lab.

June 26 Today 5 eggs were found in cage # 4 in the lab. These eggs were in poor condition when found.

July 2 Today we sorted the lizards according to their physical condition. Those that appeared to be losing weight were placed in outdoor cage # III. a total of 60 lizards was deposited in that cage. about 4 of them appear to be past the stage of being able to save them. The remainder, however, appear to be in rather good shape, although some of them are getting rather thin. These animals included those we are keeping for Lynn Rath.

The remaining 81 lizards that appear to be in fine shape were kept in the lab. and divided as follows:

cage # 2 — 15 lizards (fairly large)
" # 3 — 18 "
" # 4 — 15 " (large)
" # 5 — 18 "
" # 6 — 15 "

July 3 UCR, Riverside Co., Calif.

This morning the 81 healthy lizards that I had kept in the laboratory were released into outdoor cage ~~#~~ II.

Walt Moberly & H. Saint-Girons collected 13 live lizards and saw 3 DOR's between the canals west of Glamis on 30 June 1963.

12 mi. W. of Glamis, Imperial Co., Calif.

Aug. 18 A juvenile was picked up along the road by Shirley Hill when she made a round trip between the canals. She also found 2 adults & 1 DOR. The juvenile (♀) measured 40 mm. S-V. The adult ♂ she caught measured 68 mm. S-V, and the adult ♀ measured 69 mm. S-V.

Aug. 19 UCR, Riverside Co., Calif.

Today I finished measuring the O^2 consumption of 10 adults from the outdoor cage, as well as the 3 newly captured animals Shirley Hill got yesterday. All the animals were measured at least 3 times (each) at 15°C, 25°C, and 35°C. I am using 16 oz. squat jars with rubber stoppers for the animal containers. A glass rod, bent at 90°, is inserted into each stopper, and is attached to a manometer

Aug. 19

UCR, Riverside Co., Calif.

by a short rubber tube. The manometers are 1 ml. graduated pipettes that are graduated in 1/100 ml. The constricted ends of the pipettes have been cut off so the liquid (Brody's Solution) inside can flow freely as the air pressure inside the manometer changes. The jars are placed in a water bath that is held at a constant temperature. The manometers lie horizontal to the water surface in the bath. Some Drierite and ascarite are placed in tiny cheesecloth containers and inserted in each jar to remove water vapor & CO_2 that is produced. Two heaters and a refrigeration unit are attached, through thermoregulators, to the water bath to produce the desired temperatures. These animals (except Shirley's) were placed in the 15°C cold room this afternoon. They will remain there for two weeks (until Sept. 3), then they will have their O^2 consumption measured again at 15°C, 25°C, and 35°C. A timer is controlling the lights in the light-tight box in which they are located in the cold room. The animals are receiving 7 hours of light per day, which is

Aug. 19 UCR, Riverside Co., Calif.

approximately what they are exposed to at this time of year in the field (based on collecting data we have obtained). The lights are on from 0700 to 1400 each day. (Lizard #51 badly burned its feet when a little water entered the jar and mixed with the Ascarite. This lizard was replaced by #86 for the remainder of the measurements this time. Both animals were placed in the cold room, so there are 11 in that cage.)

Aug. 20 The lizards in the cold room are still alert, with their eyes open. There is no evidence of any of them going into hibernation yet because of the low temperature of the cage (15°C).

Aug. 21 Glamis area, Imperial Co., Calif.

We collected 4 lizards on one pass between the canals this afternoon. No DOR's were seen.

Aug. 22 Another 4 lizards were collected this morning between the canals, and 1 DOR was seen. A large number of gravel trucks (Ike Harris said there are 30 on that road now) were moving. Since only 1

Aug. 22 Glamis area, Imperial Co., Calif.

DOR was seen, it appears that relatively few animals are now active in this area. We saw Lynette Rath at Glamis. She has collected approximately 80 lizards so far this year between the canals.

The totals to date that my collecting trips have yielded are:

all lizards (July 1958 thru Aug. 1963)

Live	DOR	Total
400	114	514

Glamis area (1963 - thru Aug.)

119	54	173

Glamis area (1961-1962)

228	60	288

Glamis area (1961 thru Aug. 1963)

347	114	461

In addition, I have data from 32 animals collected by Lyn Rath.

Aug. 23 UCR, Riverside Co., Calif.

Some moist cheesecloth was spread over one side of the cage in the cold room in an attempt to keep the humidity higher in the cage. Only 2 lizards were on top of the sand with their eyes open when I looked at them at 0830 this morning.

Phrynosoma m'calli

Aug. 23 UCR, Riverside Co., Calif.

at 1330, 8 lizards were on top of the sand in the cold room cage, and the other 3 had their heads above the sand. Six of them had their eyes open. at 1600 (lights off at 1400), 5 were on the sand surface, and 4 had their heads above the sand.

Aug. 26 There were 7 lizards on the sand surface, two of which had their eyes open, at 0720 (lights on – 0700). One other lizard had its head projecting above the sand surface.

at 1130, 8 lizards were on the surface and 2 more had their heads out. a total of 7 had their eyes open. Several moved about when I removed the cheesecloth from the top of the cage to moisten it.

at 1645 (lights out – 1400) 5 lizards were on the sand surface, & 2 others had there heads above the sand. None had its eyes open.

Aug. 27 at 0730, there were 3 above the sand and 3 other heads out of the sand in the cold room cage. One lizard had its eyes open. at 1120, 8 were on the surface, & 1 other had its head out of the sand. Six had their eyes open.

Aug. 28 UCR, Riverside Co., Calif.

At 0700 (before lights went on) there were 5 lizards on top of the sand and 2 other heads out. None had their eyes open.

At 1300, 7 were on the surface, + all of them had their eyes open. Two others had their heads above the sand with their eyes closed.

At 1320, 7 were still on the surface (with eyes open) and the remaining 4 lizards had their heads above the sand.

Aug. 29 At 0830, 8 lizards were visible (6 on surface), and 4 had their eyes open.

Aug. 30 At 0745, 6 lizards were on the surface, 3 of which had their eyes open. Two other heads were visible above the sand. The lizard (#51) that had its feet + belly burned with Ascarite 8/16/63 was found dead this morning, so there are now 10 lizards in that cage.

Sept. 2 Five animals that have been at 15°C for the past two weeks were placed in the respirometer today. Their O_2 consumption was measured again at 15°C, 25°C, and 35°C. These animals were a long way from hibernating under these cold conditions.

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Phrynosoma m'calli

Sept. 2 — UCR, Riverside Co., Calif.

They were quite active when I picked them out of the cage, and they have remained so. All the lizards in the cold cage were on the surface when I went after these lizards this morning, and most of them had their eyes open.

Sept. 3 — The remaining 5 lizards from the 15°C. room were placed in the respirometer today and their O_2 consumption was measured in the same way. These animals are just as active as the group I took out yesterday. All 10 lizards are going to spend the next 2 weeks in a corner of an outdoor cage, then their O_2 consumption will be measured again. I'm anxious to see if 2 weeks in the cold room has modified their metabolism in any permanent fashion.

Sept. 4. — Glamis area, Imperial Co., Calif.

Lon McLanahan + I found one lizard late this afternoon (about 10 minutes before sundown), even though we drove rather rapidly between the canals. No DOR's were seen, although the gravel trucks are running

Sept. 4 Glamis area, Imperial Co., Calif.

all day now. Lyn Rath allowed me to measure a juvenile she captured today. It measured **43** mm S-V (♀). (See p. 51 – P. m'calli field notes for totals to this time).

Oct. 16 UCR, Riverside Co., Calif.

This morning I took 66 lizards from the outdoor cages and brought them into the laboratory for the hibernation experiment. The sky is very overcast this morning, and the weatherman predicts rain before the day is over. Consequently, none of the lizards were active when I went out to dig them up (0830). Only 1 was found entirely exposed on the sand surface. Several (~ half a dozen) had just the tops of their heads out of the sand. Many were buried just beneath the surface of the sand. Most of these were covered with less than 1/2" of sand. I found a concentration of about 20 lizards in this condition beneath a rather small tumble weed that had germinated in the outdoor cage. Two other concentrations of lizards were found. One of these (12 lizards) was beneath

Oct. 16 UCR, Riverside Co., Calif.

a piece of broken cement pipe that I had placed in the cage for shade. These lizards were resting on top of the sand directly beneath the cement. In the other case (6 lizards), all but one were located as described for the larger group. The other one was covered with about 1/2" of sand. Several other animals were dug out of burrows they had dug. In each case, the lizard was within 2 inches of the sand surface, even though the burrow extended 4 to 6 inches further. In a couple of cases the burrow wasn't over 4 inches long, and the lizard was just below the burrow entrance. The sand is still quite damp just below the surface. This moisture, apparently, is still the result of last month's rain. Twenty of these lizards will be placed in the cold room (15°C), twenty will be kept in my lab. at room temp. (~22°C), and twenty will be held in the greenhouse at 35°C. All of them will be in light-tight containers, so the light factor should be the

(2 in each condition as spares)

Oct. 16 UCR, Riverside Co., Calif.

same ~~as~~ for the lizards hibernating naturally in the outdoor cages. I am going to hold all of these lizards for 24 hours at fairly high temperature to insure that all the food they have eaten has been completely metabolized before they are placed in the experimental conditions. Although these animals are sluggish today, they are alert and capable of considerable movement. They do ~~not~~ act like other members of this species that have been completely in hibernation in previous years. Each cage will be examined daily to see when they all finally go into actual hibernation. Ten in each cage will be permitted to hibernate undisturbed until spring. The remaining ten in each condition (including those still in the outdoor cages) will have their oxygen consumption measured at 15°C, 25°C, and 35°C in mid-December, when they all should be in complete hibernation. From past observations, I feel the hibernators under all these temperature conditions will consume about the

Oct. 16 UCR, Riverside Co., Calif.

same amount of O_2 per gram per hour at any given temperature, in the range indicated previously. None of these lizards will be fed again before spring (their appetites had decreased appreciably before this recent cool spell made them become inactive).

Oct. 17 All the experimental lizards were placed in their proper cages today. The group that was placed at 35°C was divided into 2 terraria, but these are side by side in the hot room. One cage will be left alone until spring, the other contains the lizards whose metabolism will be measured in December (5♂, 6♀). The lizards placed in the 15°C room also were divided into 2 groups. One group (6♂, 5♀) will be in the dark except when I am examining them. They will remain undisturbed until spring. I plan to allow the light to reach them about 10 minutes a day*, so that I can tell whether they are actually hibernating, or simply have their eyes closed because of no light. The other group (5♂, 6♀) will receive

* each time they are examined.

Oct. 17 UCR, Riverside Co., Calif.

7 hours of light per day (as will the warm room and ambient temp. lizards) until they are all in hibernation. This is about the amount of time lizards in the outdoor cage are visible now.

Oct. 22 All the cages contain some lizards that are still active. However, at 0800 (before the lights went on) all the lizards in the 15°C room had their eyes closed. Several of these were found sitting in the fingerbowl of water I placed in each of the cages in the cold room to try to keep a higher humidity in the cages. Thus, it is obvious some of these lizards are moving about.

Oct. 23 The lizards in the 25°C and 35°C rooms are still dropping a rather large number of fecal pellets. This is not true in the 15°C room.

At 0900 (lights on - 0800*), I found the following conditions:

cage	# visible	# alert	Remarks
15°C (dark)	8	4	little activity
15°C (light)	8	4	" "
25°C	20	6	These quite active

*lights on in cages from 0800 to 1500.

Phrynosoma m'calli

Oct. 23 UCR, Riverside Co., Calif.

Cage	# visible	# alert	Remarks
35°C	20	20	very active
Outside	9	4	little activity
at 1430:			
15°C (dark)	9	6	no activity
15°C (light)	8	6	" "
25°C	17	13	" "
35°C	19	15	" "
Outside	2	0	" "
Oct. 24 at 0845:			
15° (D)	9	0	" "
15° (L)	7	3	" "
25°	19	17	some droppings " "
35°	18	18	several active some droppings
Outside	6	1	no "
at 1030:			
outside	10	9	no activity

The cage held at room temperature has a gradient from 24.8°C at one end to 27.0°C at the other where the 100 watt incandescent light is burning 7 hours a day.

Cage	# visible	# alert	Remarks
at 1400:			
15° (D)	10	6	no activity
15° (L)	8	6	" "
25°	15	10	" "
35°	18	14	" "
Outside	3	0	" "

The last sunshine in the east cage

Phrynosoma m'calli

Oct. 24 — UCR, Riverside Co., Calif.

shone on the ground about 30 minutes ago.

Most of the animals in all the experimental cages appear to be alert yet, but a few in each cage seem to be through for the winter? Very few are still active in the outdoor cages.

[The accuracy of the thermoregulators being used in the respirometer is ~~[illegible]~~ ±0.02°C.]

Oct. 25 — at 0930:

	visible	alert	Remarks
15° (D) —	10	0	none active
15° (L) —	11	3	" "
25° ——	20	16	3 "
35° ——	20	15	3 "
Outside —	6	4	1 "

Oct. 26 — at 0930:

15° (D) —	10	1	[illegible] 1 on water dish; 7 opened eyes when touched
15° (L) —	9	3	[illegible] 3 on water dish; all touched opened eyes
25° ——	18	16	1 active; others very alert
35° ——	20	16	3 active; 3 appear to be hibernating
Outside ——	4	4	none active

Oct. 28 — at 0910:

15° (D) —	11	4	1 active
15° (L) —	7	3	0 "
25° —	18	14	6 "
35° —	20	15	7 "
Outside —	4	3	0 "

(0 outside - 0830)

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Oct. 29 UCR, Riverside Co., Calif.

at 1500:	visible	alert	active	remarks
15° (D)	10	3	0	1 half on water dish
15° (L)	9	6	0	1 on H_2O dish
25°	10	2	0	lights already off
35°	21	17	0	
Outside	0	0	0	sun no longer reaching cage

Oct. 30 at 0915:

	visible	alert	active	remarks
15° (D)	11	0 (0 min.) 7 (2 hrs.)	0	2 half on dish 1 on dish
15° (L)	8	2	0	1 on dish
25°	17	12	0	
35°	20	18	0	
Outside	2	0	0	

15° D was left uncovered inadvertently for 2 hours. By that time, several of the lizards were alert & some were moving about, due to my approaching the cage. It was obvious that most of these animals are not hibernating yet, although one or two of them appear to be now. The same situation seems to be true in each of the other cages, except the outdoor cage. Most of the lizards appear to be hibernating in that cage, and only a few are still active there. As one would expect, lizards in the 25° and 35° cages are considerably more alert and active than either of the 15° groups, but the 15° groups are far from immobile.

Oct. 30

UCR, Riverside Co., Calif.

at 1445:

	visible	alert	active	remarks
15° (D)	11	3 (0 min.)	0	
15° (L)	7	4	0	1-½ on dish
25°	14	6	0	some droppings
35°	18	11	0	numerous droppings
Outside	0	0	0	

(sunlight had departed outdoor cages about 30 minutes earlier.)

Oct. 31

at 1145:

	visible	alert	active	remarks
15° (D)	11	5 (0 min.) 6 (25 ″)	0	
15° (L)	10	5	2	1 on dish
25°	16	10	0	no new droppings
35°	20	14	0	some droppings
Outside	8	5	1	

Nov. 1

at 0825:

	visible	alert	active	remarks
15° (D)	11	2 (15 min.)	0	
15° (L)	7	2	0	
25°	15	8	2	
35°	20	16	0	some new droppings
Outside	0	0	0	

The soil temperature 2 inches beneath the surface at this time was 14.4°C. This spot is in the south-west corner of one of the cages. Direct sunlight has not reached that spot for several weeks because of the sun's southern movement. The sand was quite damp at that depth.

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Phrynosoma m'calli

Nov. 1

UCR, Riverside Co., Calif.

at 1110:

	visible	on surface	alert	active	remarks
15° (D)	11	9	6 (20 min.)	0	
15° (L)	7	5	5	0	
25°	18	13	13	0	1 dropping 1 molting
35°	18	17	16	0	
Outside	4	2	1	0	100% overcast

at 1515:

	visible	on surface	alert	active	remarks
15° (D)	11	10	3 (0 min.)	0	1-H_2O dish
15° (L)	8	7	7	0	1-H_2O dish; lights on
25°	10	4	2	0	" "
35°	20	17	14	0	" off
Outside	0	0	0	0	100% overcast

Nov. 4

at 0900:

	visible	on surface	alert	active	remarks
15° (D)	9	7	1 (0 min.) 6 (30 ")	0	
15° (L)	7	5	2	0	
25°	17	15	14	2	2 droppings
35°	20	19	16	0	12 droppings
Outside	0	0	0	0	100% overcast

Nov. 5

at 1145:

	visible	on surface	alert	active	remarks
15° (D)	11	11	4 (0 min.)	0	2-½ on H_2O dish
15° (L)	9	7	6	0	1- "
25°	15	12	12	0	3 droppings 1 molting
35°	20	18	14	0	6 droppings
Outside	4	4	3	1	100% sunlight

At 1315 I measured the soil temperature at the same site I measured it early the morning of 1 Nov. The temperature now was 18.4°C.

Nov. 6

UCR, Riverside Co., Calif.

at 1315:

	visible	surface	alert	active	remarks
15° (D)	11	10	4 (0 min.)	0	1-H20 dish
15° (L)	9	7	4	0	
25°	15	13	11	0	3 droppings
35°	19	17	13	0	6 droppings
Outside	0	0	0	0	rain

Nov. 7

at 1115:

	visible	surface	alert	active	remarks
15° (D)	10	9	2 (0 min.) 3 (20 min.)	0 (0 min.) 1 (20 min.)	1-H20
15° (L)	7	5	5	0	
25°	16	10	7	0	no droppings
35°	18	16	10	0	5 "
Outside	4	2	2	0	100% sun

Four lizards were out in the outdoor cage by 1115 this morning, in spite of the fact about .23 inch of rain fell yesterday and last night. The surface of the ground was still quite damp. None of these animals were out when I looked at 0815 and 0945 this morning.

Nov. 8

at 1100:

	visible	surface	alert	active	remarks
15° (D)	11	9	3 (0 min.) 4 (10 min.)	2	
15° (L)	10	9	10	0	
25°	14	9	10	0	
35°	17	16	11	0	6 droppings
Outside	2	2	2	1	100% sun (digging)

I have the impression that all the lizards will go into hibernation

Nov. 8 | UCR, Riverside Co., Calif.

shortly. Many of them in all the cages (except outside) are becoming very sluggish & sit around with their eyes half closed. Some lizards in each cage obviously are already in hibernation (don't change positions, don't respond when they are walked on or handled, etc.) Those in the cold room that have not begun hibernation are as alert as the lizards in the warmer cages. This is as true for the lizards in the dark cage as for those in the cage receiving 7 hours of light per day.

Nov. 9 | Palm Springs, Riverside Co., Calif.

This morning at 1025, while I was photographing some Dipsosaurus dorsalis habitat near the golf course about a mile north of north of Vista Chino Ave., I found a young lizard sunning itself. I didn't have a thermometer with me, so I couldn't measure its cloacal temperature. However, the lizard was reasonably warm to the touch. It was in a very active state when found, and ran a couple of feet before I caught it.

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Phrynosoma m'calli

Nov. 9 Palm Springs, Riverside Co., Calif.

This is the latest in the year I have ever found any lizards of this species. The lizard was retained and placed in the 25° cage in the laboratory.

I have data now from 402 live and 114 DOR P. m'calli (total - 516) that have been obtained since July, 1958. In addition, I have data from 33 animals collected by Lynn Rath.

Nov. 12 UCR, Riverside Co., Calif.

at 0930:

	visible	surface	alert	active	Remarks
15°(D)	10	10	5(10 min.)	0	
15°(L)	9	7	5	0	
25°	15	11	10	0	4 droppings
35°	21	19	10	2	3 droppings
Outside	2	1	1	0	100% sun

The newly captured lizard was on the surface (25° cage).

at 1445:

15 (D)	9	9	1(0 min.) 3(30 min.)	0	
15 (L)	8	7	2	0	
25	9	7	2	0	
35	20	18	6	0	
Outside	0	0	0	0	100% overcast

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1963

Phrynosoma m'calli

Nov. 13

UCR, Riverside Co., Calif.

at 1415:

	visible	surface	alert	active	remarks
15° (D)	11	8	2 (15 min.)	0	
15° (L)	9	6	2	0	
25°	14	7	5	0	4 droppings
35°	20	17	8	0	2 droppings
Outside	0	0	0	0	fog

Nov. 14 at 1115:

	visible	surface	alert	active	remarks
15° (D)	11	10	2 (0 min.) 4 (10 min.)	0	1-H_2O dish
15° (L)	9	7	5	2	
25°	16	14	10	0	2 droppings
35°	17	15	6	0	1 dropping
Outside	2	2	2	0	hazy sun

Nov. 15 at 1015:

	visible	surface	alert	active	remarks
25°	12	7	7	0	3 droppings
35°	20	16	8	1	6 droppings
Outside	0	0	0	0	100% overcast

at 1645:

	visible	surface	alert	active	remarks
15 (D)	10	9	1	0	
15 (L)	8	5	0	0	1-H_2O

(lights out-1500)

Nov. 18 at 1120:

	visible	surface	alert	active	remarks
15° (D)	10	10	1 (0 min.) 2 (10 min.)	1	1-H_2O after 10 min.
15° (L)	10	7	4	0	1 dead (no toes)
25°	14	11	7	1	
35°	8	16	5	1	
Outside	5	4	1	0	

Most of the lizards at 35° were "out" at this time today. Many of them

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Nov. 18 UCR, Riverside Co., Calif.

appear to be "out" for the winter. They seem to be about equal to the 15° lizards in this regard. More are still appearing alert in the 25° cage than in any of the others. Even here, however, the numbers are only slightly larger than in the other cages.

Nov. 20

	visible	surface	alert	active	Remarks
at 1045:					
15° (D)	10	10	0 (0 min)	0	1 - H_2O
15° (L)	8	7	4	0	
25°	15	9	8	1	2 droppings
35°	20	18	3	0	4 droppings
Outside	1	1	0	0	Rain

The lizard that was visible in the outdoor cage was on the sand surface near the root of an annual plant that is growing in the cage (a nightshade). The vegetation is fairly dense above the lizard, but raindrops are reaching it. Nevertheless, it remains there with its eyes closed, looking like lab. hibernators.

Nov. 21

	visible	surface	alert	active	Remarks
at 0945:					
15° (D)	10	9	0 (0 min.) 1 (10 min.)	0	
15° (L)	8	5	2	1	
25°	14	13	3	0	
35°	21	19	7	0	3 droppings
Outside	1	1	0	0	100% sun

Nov. 21 UCR, Riverside Co., Calif.

The lizard that was in the open in the outdoor cage in the rain yesterday presumably is still out. at least a lizard was on top of the sand within 6 inches of the spot where the other one was seen yesterday. It appears to be the same animal (color pattern). It still has its eyes closed.

Nov. 22 at 0815:

	visible	surface	alert	active	Remarks
15° (D)	11	10	0 (0 min.) 1 (15 min.)	0	
15° (L)	8	3	0	0	no lights yet
25°	13	1	1	0	"
35°	16	10	3	0	lights on 4 droppings
Outside	2	2	0	0	sun

Both animals in the outdoor cage were under the nightshade plant within a couple of inches of each other. Neither had its eyes open. Several lizards in each of the cages (I can't say about the outside cage) are becoming quite thin. Many, however, (in all cages) look to be in fine shape yet.

Today I am keeping track of the activity patterns, if any, in the 25° cage. These animals have appeared to be the most active within the past few days, but all the animals have

Phrynosoma m'calli

Nov. 22 UCR, Riverside Co., Calif.

become quite sluggish this past week.

Sand surface temp. in 25° cage varies from 23°C to 25.4°C.

Time	visible	surface	alert	active	Rem.
0900	12	5	2	0	
1000	16	9	4	1	
1100	14	8	7	4	
1200	14	8	6	1	
1300	13	8	4	0	
1400	11	3	1	0	
1500	8	4	2	0	lights off
1600	10	0	0	0	"
1700	10	0	0	0	"
at 1215:					
15° (D)	11	11	0 (0 min) 3 (30 min)	0	
15° (L)	9	7	2	1	
25°	14	8	6	1	
35°	20	15	5	1	
Outside	2	1	1	0	
at 1530:					
15° (D)	11	10	1 (0 min.)	0	
15° (L)	7	6	0	0	lights on
25°	9	2	2	0	" off
35°	20	12	3	0	" "
Outside	1	1	0	0	total shade

The one in the outside cage is still in the same position it was in when I first saw it this morning. The other one that was out earlier was seen at the mouth of a burrow about 6 ft. from the nightshade plant at noon.

Nov. 22 — UCR, Riverside Co., Calif.

It was in the sun at that time. at 1530, however, it was nowhere to be seen.

Nov. 26 — at 1345:

	visible	surface	alert	active	Remarks
15°(D)	11	8	0(0 min.) 1(20 min.)	0	#83 dead
15°(L)	6	5	2	0	
25°	10	5	4	0	
35°	19	14	2	0	3 droppings
Outside	1	0	0	0	100% shade

The lizard in the outdoor cage was in exactly the same position in which I saw it on Nov. 22.

Nov. 27 — at 1100:

	visible	surface	alert	active	Remarks
15°(D)	10	7	1(0 min.) 1(20 min.)	0	
15°(L)	9	6	4	0	1-H_2O
25°	11	6	3	0	
35°	18	14	4	0	
Outside	5	2	2	0	100% sun

Dec. 3 — at 1115:

	visible	surface	alert	active	Remarks
15°(D)	10	9	0(0 min.) 2(15 ")	0	
15°(L)	8	6	1	0	
25°	11	4	1	0	2 droppings
35°	20	16	4	1	10 droppings
Outside	1	1	0	0	100% sun

Most of the lizards in the 35°C room are becoming quite thin. The tops of the pelvic girdles can be seen through the skin of most of these lizards.

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Phrynosoma m'calli

Dec. 6 UCR, Riverside Co., Calif.

at 1115:

	visible	surface	alert	active	Remarks
15°(D)	10	10	1 (0 min.) 2 (10 ")	0	1-H_2O
15°(L)	10	4	1	0	
25°	14	8	3	0	4 droppings
35°	18	13	5	0	#200 dead
Outside	2	1	0	0	100% sun

Dec. 11 at 0900:

					O_2 measured
15° (D)	10	9	0	0	# 85
15° (L)	9	5	0	0	# 81
25°	16	4	2	0	# 297
35°	14	10	0	0	# 40
Outside	2	0	0	0	# 121
					# 122

Both 121 & 122 were partly exposed on the surface. The sun was shining, but had not reached either of them yet. The cloacal temperature of #121 was 17.2°C, the temp. of #122 was 13.5°C.

#85 was on the sand surface, as was #81 & #40. #297 was partly exposed on the surface. #31 and #20 were dead in the 35°C cage. Many others are quite thin, but #40 is in good shape.

Today I began measuring O_2 consumption in the hibernators. After measuring all lizards used today, they were placed in a lab. cage with no heat or light other than overhead lights. They

Dec. 11 UCR, Riverside Co., Calif.

will be retained in the laboratory under these conditions until next spring.

Dec. 13

	visible	surface	alert	active	Remarks
at 0900:					O_2 meas.
15°(D)	9	7	0	0	# 45
15°(L)	8	4	0	0	#299
25°	14	7	4	0	#97
35°	13	2	0	0	# 95
outside	0	0	0	0	# 116
					# 208 +100

Both animals obtained from the outdoor cage were just beneath the sand surface. None of their bodies were visible. The body temp. of #208+100 at the time I dug it up was 8.6°C. The temperature of #116 was 8.8°C. #116 was able to right itself at that temp. when I placed it on its back. The sun was shining when I dug both of them out, but the sun's rays had not reached their burial spots yet. The 2 lizards used today for O_2 consumption from the 15°C room were on the sand surface, whereas the lizards used from the 25° and 35°C cages were both under the sand. All of the lizards used today were in good shape. All lizards, except a couple at 25°C, are now in hibernation. Even these

Dec. 13 UCR, Riverside Co., Calif.

two in the 25°C cage are alert and somewhat active only a very short time during the day. Most of their time is spent resting on the sand surface with their eyes partly closed.

Dec. 14 #70 was dead in the 35°C cage this morning. #17 & #80 were dug out of the sand in the 35°C cage, & both are in fair shape. #117 and #89 were on the sand surface – both are in good shape (also 35°C cage). #69 and #106 were uncovered just beneath the sand surface under a nightshade plant in the outdoor cage. The cloacal temperature of #69 was 15.0°C, that of #106 was 12.8°C. Both of these lizards are in fine shape. all of them had their O_2 consumption measured today.

Dec. 16 The lizard dug up in the outdoor cage for O_2 consumption measurement today was just beneath the sand surface beneath the nightshade plant. Its cloacal temp. was 13.8°C. another lizard was dead in the 35°C cage today (#101), and one was also found dead in the 15°C (light) cage at this time (#57). Nearly all the remaining lizards in the 35°C cage appear

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Dec. 16 UCR, Riverside Co., Calif.

to be in rather bad shape. They are all hibernating, but they are becoming very thin. All the other lizards seem to be getting along fairly well. The lizards dug been digging up in the outdoor cage are especially fat and sleek.

Dec. 17 The lizard dug up in the outdoor cage today was taken from beneath a concrete slab (about 8"x12"). It (the slab) was slightly buried in the ground, but two holes led from the outside to the area beneath the slab. Three lizards were on top of the sand beneath this slab. Only one of them was taken into the laboratory today. Its cloacal temperature when picked up was 7.6°C. It was able to right itself several times at that temp.

Dec. 18 The two animals removed from the outdoor cage for O_2 measurements today were beneath the same concrete slab that was examined yesterday. Both were on the sand surface, about an inch apart, beneath this slab. The head of another lizard could be seen extending from a hole that had been dug beneath the slab. Both collected lizards had a cloacal temp. of 5.6°C.

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Nevertheless, both were able to right themselves when I placed them on their backs.

I tossed a few mealworms into the cages holding the lizards I have used for O_2 consumption measurements. None of the animals acted as if it were starving to death. However, 3 lizards did eat 1 or 2 mealworms each. They were # 45 and 85 from the dark 15°C cage and # 69 from the outdoor cage. None of the other lizards showed any interest at all in food.

Some of the lizards in the 25°C still become somewhat active for brief periods during the time the light in the cage is on. This is the only cage that contains such animals. All other lizards are thoroughly "out" of it, except the animals I have been running in the respirometer. There are some of these lizards, also, that have some active periods. However, most of these lizards, within 48 hours of their confinement in the respirometer, usually have become dormant again.

Dec. 19 This morning I dug up 7 lizards in the outdoor cage to complete my

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Dec. 19

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O_2 consumption measurements. The results were as follows:

#	Sex	Cloacal Temp.	Depth Under Sand	Right itself
16	♂	7.2°C	3 in.	+
63	♂	7.6°C	2 in.	+
72	♀	7.6°C	4 in.	—
92	♀	10.4°C	Just under surface	+
123	♀	7.0°C	1 1/2 in.	+
203+1	♂	9.0°C	~~Just under surface~~ 1 1/2 in.	+
213	♂	11.6°C	7 1/2 in.	+

($\bar{x}$ for all = 9.2°C, N = 17)

Only one could not right itself when placed on its back. All but one animal that was in a burrow was facing the burrow entrance when uncovered. The exception was somewhat sideways to the entrance, but facing more toward the entrance than the bottom of the burrow. # 63, 16, and 72 were all taken from the same burrow that had been dug beneath a concrete slab. # 63 was at the top of the burrow, and a bit of its head was visible when I removed the slab. Immediately below it was # 16, and below it was # 72. All were facing the burrow entrance. Two other short burrows were also under that cement slab, but they were unoccupied at this time. Only # 213 was in a deep

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burrow. The lizard was 15 inches from the burrow entrance and about 7½ inches beneath the sand surface. This burrow was dug beneath a Solanum sp. plant. Two Coleonyx variegatus were found in a side chamber of this burrow. The chamber was only about 1 inch from the Phrynosoma. All the lizards appeared to be in excellent physical condition.

Dec. 20 I ran 4 more lizards in the respirometer today to fill in some obvious gaps in the data (2 from the outdoor cage, 1 from 25°C cage, 1 from 15°C [light] cage).

As the lizards have been removed from the respirometer, they have been placed in the cages in my laboratory that are at room temperature (no additional light other than room light. At 1000 today, the following lizards were active:

#	Former Condition	#	Former Condition
69	Outside	97	25°C
106	"	297	"
208	"	102	"
40	35°C	81	15°C (light)
95	"	71	"
117	"	200+109	15°C (dark)
56	"	103+20+30	"

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#	Former Condition
85	15°C (dark)
86	"
45	"

By active, I mean they were very alert, and moving about the cage. Thus, 3 of 15 outside lizards, 4 of 10 35° lizards, 3 of 10 25° lizards, 2 of 5 15° (light) lizards & 5 of 5 15° (dark) lizards [7 of 10 15° (combined) lizards] were active this morning.

All cages were checked for dead lizards today. The only dead animals were in the 35°C cage (2). I could find only 5 live lizards in that cage, although I thought there should be 6 in it. I'll have to check through the sand more carefully next time.

At 1230 2 additional lizards were active:

#29 and #37 – both from the 25°C cage.

Dec. 26 I checked all cages for dead lizards at 1030 today. Two were found: 1 in the 25°C cage, one of 35°C animals that had its O_2 consumption measured Dec. 14th. No lizards in either of the 15°C cages, the 35°C cage, or the outdoor cage gave any signs of being alert and active. All of them either were

Dec. 26 — UCR, Riverside Co., Calif.

under the sand, or were lying on top of the sand with their eyes closed. Two lizards (#110 + 111) were active and alert in the 25°C cage. A number of alert animals were present in the holding cages where those lizards whose O_2 consumption was measured recently are being held. They were:

#	Former Condition	#	Former Condition
200 + 109	15°C (dark)	297	25°C
103 + 20 + 30	"	87	"
86	"	37	"
85	"	117	35°C
45	"	56	"
299	15°C (light)	92	Outdoor
81	"		
67	"		
54	"		

All the 15°C(D) lizards and most of the 15°C (L) lizards are active, but relatively few of the animals from other conditions are active yet. The observations are being made at the time of day when the great majority of lizards are active, if they are going to be active. Most of them are active for only an hour or two at most each day.

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By 1120, #53 and 207 (25°C cage) were also alert and active, as well as #110 & 111. The lizards in the 25°C cage all become inactive when the incandescent light (100 watt) goes off in the cage, even though the flourescent overhead lights are still on. The incandescent light is 28 inches above the sand surface, so very little heat reaches the lizards from this light source. Nevertheless, the lizards cluster at this end of the cage continuously, but they are active only while this light is on (but not all the time it is on).

Dec. 30 Today at 1230 #79 (adult ♀) was sitting in the sunshine in outdoor cage #2. No lizards have been seen out in that cage for several weeks.

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Several animals have remained active since their Oxygen consumption was measured. Therefore, this morning 16 of the most active ones were placed in cage #2 in the laboratory by themselves. One infrared heat lamp is heating the cage for 7 hours per day. The lizards placed in this cage are:

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Phrynosoma m'calli

Jan. 3

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#	Previous Condition
69	Outdoor cage
116	" "
63	" "
72	" "
208	" "
213(+4)	" "
297	25°C
97	"
87	"
81	15°C (L)
71	"
299	"
85	15°C (D)
45	"
200+109	"
86	"

Interestingly, nearly all the 15°C lizards and ~~most~~ many of the outdoor cage lizards are included in this group, but few 25°C and no 35°C lizards are included. The 35°C animals, especially, have returned to a dormant condition. This lowered temperature they are now experiencing (25°C) apparently is necessary before they will become active again. The animals in cage #2 have gotten their appetites back again. Every lizard in the cage

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Phrynosoma m'calli

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ate several mealworms this morning when I threw them into the cage. Their appetites appeared to be almost like summer appetites.

This afternoon 2 additional lizards were added to cage #2. Both of them were very active in their previous cage (#1) at this time. Both ate several mealworms — as many as I gave to them. They are:

#	Previous Condition
93	Outdoor cage
103+20+30	15°C (D)

These are the only other lizards that are at all active now. All the remaining lizards either spend all of their time under the sand, or standing motionless with their eyes closed. All the 15°C (D) lizards (5) are now in the active cage, along with 3 from the 15°C (L) cage (of 5), 3 (of 10) from 25°C cage, and 7 (of 17) from the outdoor cage. None of the 10 from the 35°C cage are active. The soil temperature gradient at this time (1445) ranges from 41.2°C to 28.0°C. Most of the lizards are in or on the sand at the hot end of the cage. Many of them (8) are active now.

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By 1515 an additional 3 lizards became active, so I set up cage # 6 just like cage # 2 and divided the 21 lizards between the two. Both will have the same light sequence, both cages are the same size, etc. The 3 other lizards also ate the mealworms that were offered them. They are:

#	Previous Condition
54	15°C (L)
56	35°C
95	"

Another 35°C cage animal that had been used for oxygen consumption studies (#114) was found dead in cage # 6 when I cleared it of all lizards to set it up like cage # 2. Cage # 4 is now being used to hold all lizards that have not shown signs of becoming active yet. As lizards in this cage become active they will be moved to either cage # 2 or # 6.

Jan. 6

67 (15°C - L) was active most of the morning in cage # 4, so it was placed in cage # 6. Now there are 11 lizards in each of cages # 2 and # 6. # 67 ate several mealworms as soon as they were placed before it. All the other lizards in cages # 2 + # 6 ate mealworms this morning. I am going back

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to giving these lizards a 15-minute exposure to ultraviolet irradiation each week. They received their first treatment this morning.

Jan. 8 #92 (outdoor cage animal) has become active in cage #4, so it was transferred to cage #6. Although lizard #95 (35°C cage) was active enough to be moved to cage #6 recently, it has become rather dormant again. It didn't eat today, and lies on the sand with its eyes closed.

The range of temperatures in the two heated cages was measured today just as the lights went off. Consequently, the highest temperatures (soil surface) to which these lizards are exposed should be present then. The results:

cage #2	cage #6
27.0° to 42.2°C.	26.0° to 46.2°C.

Jan. 9 Today #88 (outdoor cage lizard) became active in cage #4, so it was transferred to cage #2. There are now 12 lizards in each of the active cages, although the lizards in the 25°C cage were somewhat active for a longer period than the lizards in any other cage — that is, one or two were still active for a few minutes every day or so — none of these animals are active

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any longer. Even though cage #2 is right beside the 25°C cage, the animals are behaving strikingly different at this time. The lizards in cages #2 and #6 are just like summer lizards. The eat everything I throw in the cage.

Jan. 11 The last 2 35°C cage animals (whose O_2 consumption was not measured) died today. All the rest of the lizards appear to be getting along fine (in 15° + 25°C cages). No activity at all is occurring in the 15°C room, either in light or dark cages. There is no activity in the outdoor cage either. However, several of the lizards in the 25°C cage are active very briefly now. No additional lizards have become active in the holding cage (#4). The lizards held in cages #2 and #6, however, are just as active as in summer. They eat every ant + mealworm I give them and look for more. A couple of them, though, have not been seen on the surface for a couple of days. I plan to keep track of which ones don't appear to see if it is always the same ones.

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No additional dead lizards in any of the cages. However, some animals in cage #4 look in rather sad shape.

At 1500 most of the lizards in cages #2 and #6 were on the surface. The following animals, however, were not:

Partly buried	Totally Buried
103+20+30 – 15°(D)	56 – 35°C
213+4 – outdoor	93 – outside
	92 – "
	88 – "

Jan. 14 Two lizards in the 25°C cage seem quite alert and active today.

Jan. 15 Some additional lizards in cage #4 appear to be alert now, so they were placed in cage #1 and the infrared heat lamp was turned on. These lizards are:

#	Previous Condition
16	outside cage
49	" "
106	" "
121	" "
37	25°C cage

All of them ate mealworms when they were offered.

Jan. 16 This morning 4 lizards from the 25°C cage were transferred to active cage #1 after they were weighed.

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All of them have been active a portion of each day this week (since Jan. 13). The animals transferred were: # 30, 110, 207, and 292. Their weight changes have been recorded on their original collection sheets.

Jan. 17 At 1015, after the cages were well heated (max. sand surface ~~temps.~~: 44.0°C-cage #2; 48.4°C-cage #6; 49.0°C-cage #1), lizards were captured at random in each of the cages + their cloacal temperatures were measured. In all, 15 temperatures were measured, and the results were as follows:

39.0°C	37.4°C	38.2°C
37.5	36.2	39.0
37.2	35.1	37.2
37.0	36.0	38.6
38.0	37.2	37.0

Range: 35.1 – 39.0°C Mean: 37.4°C

These lizards were resting on the sand surface. They were picked up by hand and a Schultheis thermometer was inserted into the cloaca within 10 seconds.

This afternoon 2 more lizards in the 25°C cage were actively moving about, so they were weighed and placed in cage #1. Their weights were recorded on their collection sheets. The

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lizards were # 13 and # 44. The past couple of days I have seen one or two lizards in the active cages do the very rapid "push-ups" that I generally associate with courtship or territorial defense. The relatively slow "push-ups" are performed fairly often, in addition, by most of the lizards in the active cages, but the rapid "push-ups" are quite distinct from this. At 1420 two lizards (sex undetermined) "squared off" with each other, and began to circle one another. One ~~grabbed~~ grabed the lateral fold of skin, of the other, midway between the fore- and hind-legs, in its mouth. After a brief tussle, the two separated.

Jan. 20 # 32, from 25°C cage, was placed in active cage # 1 today, as was # 46.

Jan. 21 This morning, # 111 (25°C cage) was quite active, so it was placed in cage # 1. There are now 13 lizards in cages # 1 and # 2, 12 in # 6, as follows:

#1			#2			#6	
32	106	110	116	71	297	93	97
30	111		46	63		103+20+30	95
44	207		86	200+109		54	45
16	13		88	213+4		67	56
49	121		69	299		85	72
37	292		208	81		87	92

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at 1045 a ♂ in cage # 2 tried to mount a ♀ in the cage, but she resisted his advances and escaped.

Jan. 23 at 1430 lizard #41 was out of the sand, standing with its eyes open in the 15°C (light) cage, so it was placed in active cage #6 (13 lizards in each active cage now.) This lizard was one whose oxygen consumption I measured Dec. 20, 1963, then I returned it to its original cage (the only 15°C animal I returned to the original condition). It is the only lizard in the 15°C room that has aroused so far. #123 (outdoor cage lizard) was alert in cage #4 at 1530, so it was weighed and placed in active cage #1.

Jan. 24 This morning #203+1 (outdoor cage lizard) was alert in cage #4, so it was weighed and placed in active cage #1. Now there are 15 lizards in cage #1, 13 in cage #2, and 13 in cage #6.

By 0930, #23 and #102 were alert in cage #4, so #23 was placed in cage #2 and #102 was placed in cage #6. Both animals originally were in the 25°C cage.

There are now 15 lizards in cage #1, and 14 in each of cages #2 and #6.

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Lizards in each of the active cages are becoming very aggressive. Both ♂♂ and ♀ have been observed attacking other lizards in the cage. They come along side another lizard that is facing in the opposite direction. They turn their bodies at about a 45° angle with the substrate so the opponent sees the broadest possible expanse of lizard beside it. Then they move about in a circle. At the same time each lizard makes attempts to bite the lateral body wall of the opponent.

The number of attacks that are being observed now (several per hour) are probably due to the large number of lizards in each cage. However, it appears this response is a natural one that is related to territoriality and breeding. As I have never found adults above ground until mid-February or later in the field, these animals are responding somewhat prematurely. However, I presume this response occurs in the field as soon as the hibernation period is finished. The lights still are on only 7 hours per day.

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There are still no signs of activity in either of the 15°C cages (except the one removed 1/23). Three of the lizards in the 15°C (light) cage have their heads resting on the top of the sand, but this exposure to 7 hours of light per day has not aroused any of them.

One animal was seen in the outdoor cage at 1030. Only its head was exposed. However, the sand over its back was disturbed, indicating it had done more than simply raised its head. The sand is still quite damp and well-packed from the rain of 1/21-1/22. The lizard's eyes were closed while I was watching it. Sun was shining on its head through a sparsely-leafed plant.

Jan. 28 #29 (25°C cage animal) became alert in cage #4 today, so it was placed in cage #1.

Now there are 16 lizards in cage #1, 14 in cage #2, and 14 in cage #3. I can't tell whether every animal in each of these cages eats every day, but the vast majority have tremendous appetites now. There is a mad rush across the cages when mealworms are placed in the cages. The animals

Jan. 28 UCR, Riverside Co., Calif.
eat as much now as any time during the summer. They also are active for about as much of the day as they have been under the same conditions in my laboratory in summer.

At 1430 #108 (25°C cage animal appeared to be alert in cage #4, so it was placed in cage #6. There are now 16 lizards in cage #1, 14 in #2, and 15 in #6.

Jan. 31 #39 (25°C cage) was alert in cage #4 at noon today, so it was weighed + placed in cage #2 (now 15 in #2, 16 in #1, 15 in #6).

Feb. 4 #38 (15°C - dark cage) was alert this morning at 0820 when I checked the cage. It was weighed + placed in active cage #1. This is the first lizard in the 15°C cage to become active, except for the lizard I returned to 15°C after measuring its O_2 consumption. Although none of the other animals at 15°C are alert, I've noticed several of them are beginning to change positions in the cage between my observations. This did not occur before Feb. 1 in either the dark or light cage - that is, since the animals went into hibernation, but is occurring in both cages now.

Feb. 4 — UCR, Riverside Co., Calif.

The two remaining animals in the 25°C cage have been shifting position ever since the rest of the animals in that cage were removed and placed in active cages.

Feb. 6 — at 1400 a copulating pair were seen in cage #2. The ♂ had its left hind leg over the tail of the ♀ & his tail was beneath hers. The ♂ had one of the ♀ head horns in its mouth. I don't know at what time copulation began. It lasted until 1407 when the ♀ began to walk away from the ♂. The ♂ made no pelvic thrusts while I was watching them. The other lizards in the cage ignored the pair completely. The ♀ (#86) came from the 15°c (dark) cage & the ♂ (#297) came from the 25°C. cage. Both had been used in the O_2 consumption measurements in mid-December. The ♀ is quite fat, as though she may have some developing eggs inside her. I'm not sure copulation was successful, since the hemipenes of the ♂ were retracted + no (semen) sperm were visible around the cloaca of the ♀ when I picked them up to examine as soon as they separated. However, I was able to squeeze a drop of a milky liquid from the ♀'s cloaca,

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which may or may not have been semen. I did not have a microscope set up at the time to examine the material, which dried very quickly on the slide.

Feb. 7 #65 (15°C-light-cage) was alert at 1330 today, so it was weighed and placed in cage #1 (17 in #1, 15 in #2, 15 in #6). a couple of the others in the 15°C cage (light) have shifted positions again.

Feb. 10 # 208+100 (outdoor cage) was alert in cage #4 at 0830 today, so it was weighed and placed in cage # 2 (17 in #1, 16 in #2, 15 in #6).

Feb. 11 at 1245 an attempted copulation was observed in cage #1. The ♂ (#38 - from 15° [dark] cage on 2/4/64) was grasping the horns on the right side of the head of the ♀ (#207 - 25°C cage [no O_2 measure.] - emerged 1/16/64). The tail of the ♂ was wrapped around that of the female, but his cloaca was on top of hers. The left hemipenis was everted, but was in the air above her back. The ♂ released his grip and walked away after I had been watching for a couple of minutes. My entering the room at 1245 may have disturbed him sufficiently to cause him to break contact. The

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♀ was quite puffed in the abdomen. I could not distinguish any eggs by abdominal palpation, but she appears to contain some large eggs.

#121 (outdoor cage) looks very thin, + is remaining fairly dormant, so it was returned to cage #4 from cage #1 (now 16 in #1, 16 in #2, 15 in #6).

One lizard in the outdoor cage still exposes its head occasionally, but I have not seen it with its eyes open yet. Today another lizard in the outdoor cage was digging a burrow. This is the first real activity I have seen in that cage since last fall.

Feb. 17 When I arrived in the office this morning, I found the remains of three eggs in cage #2. Two of these were just yellow spots smeared on the top of a log in the cage. The third egg was completely dessicated, but was intact. It, also, was on top of the log. I have no evidence as to which lizard laid the eggs, but I suspect it was probably #86, which was copulating Feb. 6. I'm not at all sure the copulation was successful, but other ♀ lizards have laid infertile eggs in my laboratory, so

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successful copulation apparently is not necessary before eggs will be deposited. (#86 is quite thin now.)

Feb. 26 At 1135 I saw #297 (♂ from 25°C cage – O_2 measured) attempting to mate with #39 (♀ from 25°C cage – O_2 measured). He was on her left side. He had grabbed the horns on the left side of her head in his mouth. His right hemipenis was extended and was touching her cloaca, but I couldn't tell whether he had succeeded in penetrating the cloacal opening or not. I could find no semen around the vents of either animal after they separated.

Feb. 28 Five eggs were lying on top of the sand in a group in cage #2 this morning. They were quite dessicated when I found them, so I was unable to incubate them. They appeared to be normal eggs in all respects (size, shell, etc.). Females #46 (25°C cage – no O_2 measurement) and 200 + 109 (15°C – dark cage – O_2 measurement) both feel as though they contain eggs (both are in cage #2).

#97 (15°C cage – O_2 measured) and #85 (25°C cage – O_2 measured), both in cage #6, feel as though they may also possess eggs in the oviducts. Consequently, I

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moistened a corner in both cages 2 and 6 to see if the females will bury their eggs in moist sand hereafter.

Mar. 4 This morning 5 eggs were lying on the sand surface at the spot I had moistened in cage #2. I don't know which lizard laid the eggs because the only 2 ♀♀ in that cage I had checked previously (#46 and 200+109) still feel as though they contain eggs. This morning both #297 and 39 also felt as though they contain eggs (cage #2). #207 was transferred from cage #1 to #2 because she appeared to contain eggs. The eggs that were laid either last night or early this morning were already rather dessicated, even though they were resting on damp sand. All the eggs were fertile, since each contained a blastodisc about 7 mm. in diameter. Unfortunately, they were dessicated too far to be able to incubate them successfully.

#64 (25°C cage, O_2 measured) was dead in cage #4 this morning, so it was transferred to cage #5. I also transferred several lizards to cage #5 from cages #1, 2, & 6.

Mayhew
1964

Phrynosoma m'calli

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The lizards that are in each cage are as follows: ~~(12 per cage):~~

cage #1	#2	#5	#6
13	23	38	41
16	39	54	45
29	46	56	49
30	~~63~~	63	67
37	69	64	72
44	86	71	85
65	88	92	87
81	116	106	93
110	200+109	208	95
111	207	213+4	97
123	208+100	292	102
203+1	297	299	103+20+30

Thus, 11 lizards are in cage # 2, 12 lizards in each of the other cages (total = 47). The following ♀ in cage #2 appear to be gravid: 23, 46, 200+109, + 207; the following may be gravid: 39, 88, + 208+100.

110 and 123 (cage # 1) both act as though they may be sick. When I pick them up, they bow their heads and tails into the air in an unnatural posture, and retain this position for some time after I put them back in the cage. I don't know whether it might be lack of ants in the diet or insufficient ultraviolet

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light that could be causing this response. I have never observed it before in any *Phrynosoma*.

None of the animals in the outdoor cage are even visible any longer, let alone be active. The lizards in both 15°C cages shift positions between my observations, but no more of them have become active or alert.

Mar. 6 I measured the temperature range in cage #5 to see if the available substrate temperatures were approximately the same in all heated cages. The range in #5 is 26.8° to 45.6°C which is within the ranges of the other heated cages (#1: 30.0°–49.0°C; #2: 26.5°–44.0°C; #6: 26.0°–48.4°C).

#117 and #40 (both 35°C cage lizards) are the only ones left in cage #4. They have been moving about the cage rather frequently this week, judging by their locations each time I look in the cage. However, they are always resting on the sand with their eyes closed each time I look at them. When I picked them up today they opened their eyes and moved about in a manner atypical of this species;

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when it is in hibernation. Therefore, I decided to turn on the heat lamp in that cage. Both lizards moved into the warm area in a matter of minutes. Both animals are quite thin now. I placed 2 mealworms and several black ants in the cage with them. #40 ate 1 mealworm and several ants in a little while, but #117 was not observed eating anything. It made a couple of passes at ants as they walked past, but it didn't succeed in capturing any ants while I was watching. Both lizards have been moving about the cage quite frequently since the heat lamp was turned on.

Mar. 10 This morning 2 dessicated eggs were found on the sand surface in cage #5. No eggs could be located beneath the sand. The eggs probably were not fertile, since no trace of a blastodisc was visible in either egg.

At 1400 I found the last 2 lizards in the 15°C cage (light) awake and alert in their cage. They were brought back to the laboratory and placed in cage #4, which has now become

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an active cage. They are lizards #22 and 42. The lizards in the 15°C cage (dark) are shifting their positions rather often now. Two of them insist on pushing their abdomens against the glass walls of the cage so that they are effectively on their sides. I moved both of them from this position yesterday, but they were back in the same positions today.

Mar. 11 A single dessicated egg was seen on the sand surface of cage #2 this morning. There was no evidence of a blastodisc on the egg.

#85 (a very fat ♀, originally from the 15°C dark cage – O_2 measured) was observed digging a large hole in the packed sand at the end of cage #6. The sand is packed because I have been pouring water on it occasionally at that spot. She abandoned the burrow after I poured water on the sand above her. She returned to her digging as soon as I left the cage.

Mar. 12 The burrow that was being dug yesterday afternoon was completely filled and covered when I came in the laboratory this morning (0800). The eggs were left in place until 1130. Then

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I carefully dug at that spot and uncovered 5 eggs that were in fine shape. Blastodiscs were visible in 4 of the eggs, + one may be present in the other one, but sand stuck to it so effectively I can't tell for sure. I don't know which lizard laid the eggs, however, since #85 is as fat today as she was while digging yesterday. The eggs were lying against the wooden floor of the cage encased in damp sand. The measurements of the eggs were:

16.9 mm X 11.5 mm (no blastodisc seen)
21.1 " X 11.9 "
20.6 " X 12.7 "
18.7 " X 11.5 "
19.8 " X 11.5 "

The first two of these eggs were placed in an empty finger bowl in the Vapor Temp humidity chamber. The last three were placed in a similar finger bowl in which moist sand had been placed. This bowl also was placed in the Vapor Temp (at noon). The temperature is set for 90°F and the relative humidity will be as high as I can get it (92% at this time).

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At 1300 I saw a ♀ (#207) in the process of laying an egg in cage #2. She had laid one egg by the time I first observed her, and was preparing to lay a second egg. She was on the sand surface at the edge of the wet spot of sand. She was standing with her front legs extended, the posterior portion of her body was resting on the sand. She kept her eyes shut most of the time. Occasionally she would rub the base of her tail laterally across the sand half a dozen times or so. An interval of 37 minutes passed between laying eggs #3 and #4, 26 minutes elapsed between eggs #4 and #5. The ♀ rolled the eggs on the sand by the lateral motions of her pelvis and tail. It appeared as though she was trying to cover the eggs with sand as well as push them into the sand. These eggs were separated into two groups: 2 eggs were placed in a bare finger bowl, 3 eggs were placed on damp sand in another finger bowl. These bowls then were placed (at 1500) in the VaporTemp humidity

Mar. 12 UCR campus, Riverside Co., Calif.

chamber even though no blastodiscs could be seen in any of the eggs. The egg measurements were:

15.8 mm	X	10.0 mm	} bare dish
18.0 "	X	10.0 "	}
16.1 "	X	10.2 "	
16.0 "	X	11.0 "	
17.0 "	X	9.4 "	

Mar. 13 All the eggs, with the possible exception of 1 egg in the dry paper bowl from 3/12, are looking fine. The one egg shows a very slight dent in it (1000). At 1300 one of the 3/11 eggs on moist sand contained what looked like a water blister on one side.

Mar. 14 At 1830 one egg (3/11) in dry dish has a slight dent in it.

Mar. 16 All the eggs look very much as they did on 3/14.

Lizard #110 still goes into a rigor when handled, & the skin on the belly is beginning to look like parchment, with a bit of red stain on it. Consequently, I put it in cage #4 and moved #22 and #42 to cage #1. Both of the latter two lizards are eating well now. The first couple of days they were in cage #4 (lights on) they ate only a couple of mealworms

apiece, and totally ignored the ants we put in the cage. Now, however, they eat all we put in front of them.

Mar. 17 At noon I discovered a relay in the Vapor Temp. had stuck, so the chamber was 160°F (71°C). The 3 eggs from 3/11 on moist sand were still nice & turgid (one still has the water blister-like bump on one side). The fertile 3/11 egg in a dry finger bowl still is fully turgid. However, the small 3/11 egg that I suspected was infertile is now collapsed & rather hard. None of the 3/12 eggs are in good shape (they were all believed to be infertile when placed in the Vapor Temp). The 2 3/12 eggs in the bare dish are beginning to have mold on them. The 3 3/12 eggs on moist sand have become somewhat crenulated. The interiors of each of these eggs is semi-solid, and there is no trace of an embryo.

The fertile 3/11 eggs were opened, with the following results:

The egg with the blister was still liquid inside. There was a trace of what appeared to be a long-dead

parchment-like with reddish flecks on it.

Mar. 17 UCR, Riverside Co., Calif.

embyo. No details could be seen, but there was an accumulation of dark material that looked like the heart of the other embryos. Another egg from the sand dish contained an embyo 6.8 mm. long. Its eyes were well developed, and its heart was visible. The last egg in the sand dish also contained an embyo that looked quite similar to the preceding animal. The good egg in the bare finger bowl contained a smaller embyo than the others — about 3 mm. long. The eyes were quite evident, but no other structures were identifiable. Since these eggs definitely are fertile, successful matings obviously occurred in my indoor cages.

Mar. 18 At 1100 today ♀ #200 +109 (15°C cage-dark; O_2 measured) was digging in the dry sand in the middle of cage #2. I poured water over the spot, since she was able only to make a circular depression in the sand. At 1300 she had a hole started in the damp sand. It already projects laterally several inches beneath the sand surface.

#116 (outdoor lizard; O_2 measured) died today in cage #2. The skin on the belly was parchment-like with reddish blotches on it.

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This is most pronounced on the throat and tail. The lizard was not particularly thin or run-down in appearance.

None of the remaining 15°C cage (no light) lizards have emerged from hibernation. All of them still are hibernating on top of the sand (as did the 15° cage, 7 hrs. light, lizards).

At least 3 outdoor lizards are out of hibernation now. They were seen on the sand surface at 1330. I feel reasonably certain they have just emerged, since we've been having very strong winds blowing the past several days. Judging from my observations in the field, these lizards rarely venture forth when the wind is blowing hard.

Mar. 19 I turned on the overhead lights in my laboratory at 1945, and at 2000 a student came in to tell me two of the lizards were mating. I'm not sure the mating was successful, although the ♂ (#69 — outdoor cage, O_2 measured) released his grip on the head spines of the ♀ (#23 — 25°C cage, O_2 measured) voluntarily at 2030. The ♀ is rather fat, as though she may be full of eggs. There are two burrows in moist sand in the

Mar. 19 UCR campus, Riverside Co., Calif.

cages now (cages # 2 and 6). One was dug by #200+109, but I'm not sure who is digging the other one. Two lizards were in the one dug by #200+109 when I came into the lab. tonight.

Mar. 20 When I arrived at the laboratory at 0800 the burrow in cage # 6 was filled in. I began digging for eggs at 0900. I found 5 eggs in excellent shape against the wooden floor of the cage. The burrow had been sealed with dry sand, so the eggs had mostly dry sand around them, although there was moist sand on one side of them. I placed the eggs in damp sand in a finger bowl (the eggs are entirely covered with autoclaved sand) and placed it in the Vapor Temp. I can't turn the power on in the chamber, but I will let them incubate at room temperature until the machine is repaired. The egg measurements are:

size (mm)	weight (gms)	blastodisc (mm)
19.0 X 11.6 mm	1.45	6.8
18.7 X 12.3	1.45	4.3
19.0 X 11.9	1.42	6.0
17.3 X 11.8	1.34	
19.0 X 12.5	1.45	

Mayhew 1964

Phrynosoma m'calli

Mar. 20 UCR campus, Riverside Co., Calif.

Temperature in the Vapor Temp is 84°F, relative humidity is approximately 92%.

The 3 lizards that have just emerged from hibernation in the outdoor cage were weighed + measured today:

#	sex	wt. (gms)	S-V length (mm)
61	♂	15.2	73
73	♀	16.0	70
77	♀	13.3	71

At 1155 I saw ♂ #45 (15°C cage [dark], O_2 measured) trying to mate with ♀ #41 (15°C cage [light], O_2 measured), while at the same time ♂ #87 (25°C cage, O_2 measured) was holding a piece of lateral skin of #45 in its mouth. #45 was having a very difficult time hanging on to the head spines of the ♀ and at the same time trying to dislodge the grip of the other ♂. The struggles of #45 caused the entire group to roll over + over on the ground. Eventually the ♀ escaped and buried in the sand. #45 could not escape from #87, however, and the two rolled over + over, back and forth across the cage. After watching this scene for about 10 minutes, I picked up both males to check their numbers. However, even this handling did not

Mar. 20 UCR campus, Riverside Co., Calif.

cause #87 to release his grip. about 5 minutes after I released them, however, #45 escaped from #87. Nevertheless, #87 pursued #45 for some time. #87 succeeded in getting a grip of the lateral fold of skin on #45 once more, but #45 was able to escape after only a couple of minutes. #87 kept harassing #45 by chasing, etc. for most of the rest of the afternoon.

This afternoon a lizard began digging a hole at the edge of a wet spot in cage #1. This morning was the first time I moistened sand in this cage.

Mar. 23 This morning I found both holes (in cages #1 and 2) filled in, so I dug them out. There were 6 eggs in cage #1 and 5 eggs in cage #2. The eggs in #1 did not have sand packed tightly around them in the hole, so they were somewhat dessicated. Nevertheless, they were fertile (blastodiscs were visible on some; one broke as I removed it from the sand, & it contained blood islands, etc. of an embryo). The eggs from #2 were in fine shape yet. All of them were weighed & measured, then put in finger bowls in damp sand & placed in the Vapor Temp. relative humidity chamber at room temp (it hasn't been repaired yet).

Mar. 23 UCR campus, Riverside Co., Calif.

The measurements were:

cage # 2

size (mm)	weight (gms)		blastodisc (mm)
19.2 X 12.2	1.59		approx. 6.0
21.3 X 12.5	1.68		" 6.5
22.0 X 11.8	1.56		7.4
20.7 X 12.0	1.65		6.5
20.4 X 10.9	1.26	(slightly dry)	4.6

cage #1 (all partially dry - 1 broken)

16.5 X 10.0	0.78	
16.0 X 10.5	0.77	
15.5 X 10.0	0.69	approx. 6.0
16.0 X 11.0	0.73	" 6.0
16.5 X 10.8	0.87	" 6.0

Mar. 23-25 Glamis area, Imperial Co., Calif.

Bland Ewing, Scott Fowler, Bill Crowley & I looked for these animals whenever the weather permitted, but apparently most of these lizards still are in hibernation. We found 1 young one alive, and another young one just after it was hit by a car. No adults were seen, alive or DOR during the 3 days we were here. However, only the last day was warm enough or calm enough for these lizards to be active normally. Overcast & wind the first two days would have kept them relatively inactive. Today was

Mar. 25 Glamis area, Imperial Co., Calif.
a beautiful day, however, so there was no reason for adults not being active today, if they were out of hibernation yet.

Mar. 26 UCR, Riverside Co., Calif.
This afternoon a new burrow is being dug in cage #6. The opening to the burrow is just at the edge of the wet area.

Mar. 27 The hole that was being dug yesterday was closed this morning, so I dug it up. Five eggs were buried in it. However, I don't think any of them are fertile, since I can't detect a blastodisc on any of them. Nevertheless, I weighed + measured them, + placed them in the Vapor Temp. on damp autoclaved sand. Their measurements were:

Size (mm)	Weight (gms)
17.6 X 10.4	0.95
17.9 X 11.2	0.90 (soft)
18.5 X 9.8	0.91
17.2 X 10.9	0.87
18.2 X 10.8	0.94

The eggs are being weighed on a Mettler P120 balance that is supposed to be accurate to ± 3 mg.

None of the lizards in the 15°C cage or in the outdoor cages are

Mar. 27 UCR campus, Riverside Co., Calif.
active this morning. The heavy rains earlier in the week (approx. 1.7 inches) has the outdoor cage so moist no lizards have been seen on the sand surface this week.

April 6 There are now 2 lizards active in each of the outdoor cages, but these are the only ones I've seen so far.

April 9 Today Scott Fowler & I weighed & measured all the lizards currently in the indoor cages in preparation for their release near Glamis tomorrow. I plan to release them near our usual campsite 8 miles west of Glamis. One animal was kept for Don Brummel's high school class, and 8 were given to Rudy Ruibal for Comp. Anatomy lab. (these were sick and quite thin). The rest (35) will be taken out to Glamis or Palm Springs (4) (total-39) when the field zoology class goes out tomorrow. The measurements were recorded on the individual collecting sheets in the "Laboratory Experiments — Reptiles" notebook.

None of the 15°C (dark) lizards (3 left) are active yet. A couple of them shift position between my observations, but don't become alert.

Mayhew 1964 | Phrynosoma m'calli |

April 13 UCR, Riverside Co., Calif.

Today I found several lizards on the surface of the ground in the outdoor cages, so I brought them into the laboratory to weigh + measure them. Then cage # III was dug up to see where the rest of the lizards were. To my surprise and disgust, only 2 lizards were still under ground in that cage, although I had placed approximately 60 lizards in there last fall. There were no traces of additional burrows, and no skelitons, so it seems obvious people took them away last fall before they hibernated. We were going to dig them up now because our new permanent lizard cages were started this morning, + the old cages are in the way of the amphibian cages being built under the same contract.

The 2 animals we captured near Glamis this past week-end were toe-clipped, weighed + measured in preparation for measuring their oxygen consumption.

April 14 No additional lizards were found when we dug up cage # II today. Apparently the few lizards I've been seeing on top of the ground the past few weeks were all that were left in the outdoor cages

June 3 — Glamis area, Imperial Co., Calif.

Today I released an additional 2 lizards that I had used for an experiment earlier. They were released 11 miles west of Glamis. They were toe-clipped #112 (♂) and #128 (♀). Thus, 40 P. m'calli have been released thus far in 1964 (3 in 1962). We looked for lizards between the canals from 1030 to 1200 and from 1540 to 1700. However, we found no live m'calli today, even though the weather appeared to be fine for their activity. We found 4 DOR, nevertheless. Shirley Hill gave us 2 animals she caught today.

June 4 — We looked for m'calli between the canals from 0700 to 1030. We caught 7 live m'calli during this time, but saw no DOR. The animals did not seem to be nearly as abundant as in previous years. The highway is paved all the way to Blythe now, so large trucks, house trailers, boats, etc. are all using the road. I don't know whether this accounts for any marked reduction in lizards along the road or not. We caught 1 more m'calli when we patrolled the road from 1620 to 1730. No DOR were seen this afternoon either.

Mayhew 1964

June 5 Ocotillo Well area, San Diego Co., Calif.

We drove the road between the Anza-Borrego State Park boundary and Ocotillo Wells (south of Ocotillo Wells) from 0655 to 1000, looking for m'calli. We collected 6 of them during this time, most of which were found within a mile of the power substation located at the second bend of the road.

June 10 UCR campus, Riverside Co., Calif.

Today I divided the recently captured lizards into 2 groups of 8 each. Both groups were placed in light-tight containers. One group is being kept in my office on 15 hours of light each day from a single [redacted]00 watt incandescent light. The other group is in an identical cage (4' x 2' x 1') in a environmental chamber in greenhouse 16. These animals also are on a 15-hour photoperiod from a [redacted]00-watt incandescent light bulb. However, this will be changed shortly. The lights in both cages go on at 0500 and off at 2000. A thin layer of sand is on the bottom of the cages, so they have a reasonably normal substrate. However, the sand is not deep enough for them to bury themselves,

June 10 — UCR campus, Riverside Co., Calif.

completely. Both groups of animals will receive a dose of ultraviolet irradiation once each week for 15 minutes. The greenhouse animals will have their photoperiod reduced rather rapidly to simulate the light conditions in the fall. However, the rate of light reduction will be greater than normally occurs. The animals will have the light reduced as follows:

Date	No. hours of light	Time of light
6/10	15	0500 — 2000
6/15	13	0600 — 1900
6/22	11	0700 — 1800
6/29	9	0800 — 1700
7/6	7	0900 — 1600
7/13	6	0930 — 1530

Thus, by July 13 these animals will be experiencing the approximate light regime of field animals in late September or October.

The lizards kept in my laboratory, on the other hand, will continue to receive 15 hours of light per day as long as the experiment runs. If the length of photoperiod has any effect on the time these lizards enter hibernation, this experiment should demonstrate it.

June 15 UCR campus, Riverside Co., Calif.

The lights for the greenhouse lizards was reduced to 13 hours this morning. The light intensity in each cage was measured with a Weston illumination meter. The range of light intensity in the laboratory cage (15 hrs per day) was 40 to 420 foot-candles. The range in the greenhouse cage (reduced light each week) was 60 to 480 foot-candles.

June 22 The light in the greenhouse cage was reduced to 11 hours today.

June 29 The light in the greenhouse cage was reduced to 9 hours today.

July 6 The light in the greenhouse cage was reduced to 7 hours today.

July 13 The light in the greenhouse cage was reduced to 6 hours (0930 to 1530) today. The light will remain like this until the end of the experiment.

July 23 This morning 6 dried eggs, all presumably fertile, were found in the greenhouse cage. The eggs were scattered about the lighted corner of the cage. The eggs were well developed, the most mature corresponding roughly to a 72 hour chick embryo (conspicuous blood vessels). The egg coverings were spotted with white, 8-pointed crystalline deposits which yielded gas,

July 23

UCR campus, Riverside Co., Calif.

upon the addition of 2N HCl. I have never seen deposits of this sort on any other reptile eggs I have handled.

Some of the lizards exposed to 6 hours of light per day are beginning to act as though they are going to become dormant shortly. They lay around the cage most of the time, rarely moving about. They are not eating as much as they have been, and their pelvic girdles are beginning to show through the skin on the back. Three of the animals behave this way at the moment.

July 30

The three lizards still are acting as though they are going into hibernation. The remainder in that cage are still very active, however. One male has been seen attempting to mate with a couple of females the past few days. All the lizards in the 15 hour cage are still quite active and eat all the mealworms offered to them. I don't know whether mating activity is occurring in this cage or not, since the cage is opened only very infrequently.

Aug. 20

UCR campus, Riverside Co., Calif.

This morning I ran 2 adult (field lizards) females in the respirometer at 45°C. These

Mayhew 1964

Phrynosoma m'calli

Aug. 20 UCR campus, Riverside Co., Calif.
were two of the lizards Walt Moberly brought back from Glamis yesterday. The animals were held at 45°C for over 1½ hours. They were above 40°C for over 2 hours. When removed from the chambers, both lizards were still in fine shape. One of them hissed & jumped and anyone's hand that was brought close to it.

Sept. 1 Shirley Hill tells me she trapped two animals in the Algodones Dunes this summer in her mammal traps. These are the first P. m'calli I have any record of in the dunes, although I found one DOR along the road about 1 mile east of the Coachella Canal on the shoulder of the dunes.

Sept. 2-3 Glamis area, Imperial Co., Calif.
We found only 2 adult ♀ and 2 juveniles (alive) and 1 adult ♀ (DOR) during this trip. (See Journal)

Sept. 4 Ocotillo Wells, San Diego Co., Calif.
We found 2 juveniles, but did not see a single adult at this site (see Journal).

To date, I have obtained data from the following number of lizards (this list excludes the measurements made on 33 lizards that belonged to Lyn Rath);

Mayhew
1964

Phrynosoma m'calli

Sept. 4 Ocotillo Wells, San Diego Co., Calif.

all lizards (July 1958 thru Sept. 1964)

Live	DOR	Total
431	120	551

Glamis area (1961 thru 1964)

369	120	489

Sept. 8 UCR campus, Riverside Co., Calif.

Two adult ♀ were held in the respirometer at 45°C for two hours today. They showed no ill effects when they were removed (field lizards).

Sept. 22 All lizards in both experimental chambers seem to be quite active again. The 3 lizards in the 6-hour cage that acted as though they were preparing to enter hibernation at the end of July are just as alert and active as any of the others. None of them ever became completely dormant, even for a brief period.

Oct 3-4 Glamis area, Imperial Co., Calif.

Data were obtained from an additional 12 animals on this trip (1 ad, the rest young). One of these was a DOR. Totals to date are:

all lizards (July 1958 thru Oct. 1964)

Live	DOR	Total
443	121	564

Glamis area (1961 thru Oct. 1964)

381	121	502

(plus 13 temp. measurements of Lyn Roth's lizards.)

Oct. 5 UCR campus, Riverside Co., Calif.

The lizards in both the 6-hour and 15-hour cages are still very alert and active. There is no suggestion of any of them ready to hibernate now.

Nov. 9 The apetites of all the lizards have become greatly reduced the past two weeks. Although all the lizards still eat on occasion, none of them eat very much. The animals in the 6-hour cage seem more active and alert than the 15-hour lizards. No animal in either cage actually is in hibernation yet, although a couple in each cage seem to be approaching that condition.

Dec. 4 All but 2 lizards in the 15-hour cage now have died. #6, 9, and 15 have died this past week. The remaining two seem to be in good shape and show no signs of hibernating. Both ate some mealworms today. I think the lizards in this cage I thought were preparing to hibernate simply were sick animals. The lizards in the 6-hour cage all are in relatively good shape. Some of them are becoming a bit thin, but they still are active and eat some. None of them, however, eat as

Dec. 4 UCR campus, Riverside Co., Calif.

much as they normally do during the summer. I measured the cloacal temperatures of all the 6-hour lizards at 1130 today. All of them were clustered beneath the light. Their temperatures were:

35.5°C	34.8°C
32.4	34.0
34.4	34.0

They seem to be showing no inclination to go into hibernation, although in the past all P. m'calli have been dormant by 15 December. The remaining lizards in the 15-hour cage are acting similarly. Both groups eat little or nothing, but they are not becoming dormant as in past winters.

Dec. 15 Today I measured the oxygen consumption of all P. m'calli in the hibernation experiment (at 35°C, since this was the only temperature at which a significant difference in metabolic rate was observed in hibernating lizards last winter).

To my surprise, all the lizards (that remained inactive in the respirometer) had metabolic rates that were similar to hibernating lizards held at low temperatures last winter. The

Mayhew 1964

<u>Phrynosoma m'calli</u>

Dec. 15 UCR campus, Riverside Co., Calif.

differences between animals held at 15°C, 25°C, or in outdoor cages in 1963, and the 1964 lizards were not statistically significant. (The 6-hour and 15½ hour lizards [1964] were grouped together, since there was no difference in metabolic rate between them.)

No. Lizards	Date of experiment	Experimental Temperature	O_2 consumption at 35°C (cc/gm/hr) Mean ± S.E.	Range
11	Dec. 1963	15°C	0.11 ± .010	.09 – .14
11	" "	25°C	0.11 ± .025	.08 – .17
17	" "	5–15°C (outdoors)	0.13 ± .005	.07 – .23
6	Dec. 1964	20–38°C	0.14 ± .009	.10 – .20

Dec. 21 The hibernation experiment was terminated today, since this is the shortest day of the year and none of the lizards show any inclination to become dormant. Thus, it seems reasonably safe to say that dormancy and reduced metabolism during the winter are controlled by different mechanisms. In 1963, lizards held continuously at 35°C became dormant (equal to all the others), but did not possess a reduced metabolism. This year, on the other hand, the lizards reduced their metabolic rate, but did not become dormant under either light cycle.

Dec. 21 UCR campus, Riverside Co., Calif.

Consequently, it appears at this time that dormancy may be controlled (or at least influenced) by reduced photoperiod at the proper time of the year, and reduced metabolism may be greatly influenced or entirely controlled by a reduction of temperature at the right time of the year. (Reduced light in summer did not produce an effect, nor did keeping animals at 15°C in summer have any effect.)

The temperature ranges in the two cages are (Dec. 21):

15-hour		6-hour
23°C	- minimum -	20°C
35.2°C	- maximum -	35.0°C

During the summer, temperatures in both boxes ranged between 25°C at night and 38°C in the hottest times of the day (measurements made 15 July 1964).

Dec. 22 All the remaining lizards have been moved to an aquarium (terrarium) in my office, and are being held there without any additional light or heat (except that received from the overhead lights & office heating system).

Jan. 15 UCR campus, Riverside Co., Calif.

Today Shirley Hill took 6 of the experimental animals back to Imperial County to release. I have now released 62 of these lizards after they were marked. Some were marked and released immediatly while others were released after being used in experiments.

1967

Apr. 26 West of Glamis, Imperial Co., Calif.

Shirley Hill Wright, Peggy Hansel, Peter Bartlett, David Specht and I collected along the road between the canals today from 1010 to 1645. The weather seemed to be ideal for these lizards — the preceding week had been windy, but now no wind was blowing. The air temp. reached the low 80's during the day. We captured 19 lizards, and had 2 escape from us. I released 2 of the smaller ones after measuring + toe-clipping them. Only 1 DOR was seen on the road. Traffic was fairly heavy, compared to the middle of the week in earlier years, but it did not interfere too much with our operations. The lizards were fairly abundant until about noon (we picked up 15 on the

Apr. 26 West of Glamis, Imperial Co., Calif.

first pass), but for some reason were not at all numerous after that time. The day was cool enough so they should have been able to be active through the middle of the day, but few were. We caught the last one we saw at 1535, even though we continued to drive the road until 1645. Only 3 horned lizards were seen after 1230. No toe-clipped lizards were captured.

May 15 Palm Springs Panorama, Riverside Co., Calif.

Shirley Wright, Rich Philibosian and I came here to collect *Uma inornata*, but found several (10) of this species as well. They were sitting on the edge of the pavement in most cases. At one location we found 3 adults (2♂, 1♀). We reached the area at 0820, and quit looking at 1230. However, these lizards were seen only between 0830 and 0950. The official air temp. today was 101°F. at Palm Springs. This was the greatest number of *P. m'calli* we have captured in one day in this area (more in a day at Glamis).

May 19 West of Glamis, Imperial Co., Calif.

These lizards were fairly abundant this morning, even though we didn't see a single one yesterday afternoon. I don't know why we did not see

Mayhew 1967

May 19 West of Glamis, Imperial Co., Calif.

any yesterday because the weather conditions appeared to be ideal for them (no wind or clouds, air temp. in the high 80's F.). at any rate, we caught 15 of them this morning between 0700 and 1000. I continue to forget to record that this is the only species of Phrynosoma in S. Calif. that retains a trace of the umbilical scar throughout life. This scar remains as a prominent feature on the ventral body surface as long as the animal lives.

May 20 Palm Springs Panorama, Riverside Co., Calif.

I took the field class to this location to collect lizards this morning. Among other things, we collected 14 of this species. These lizards appear to be becoming one of the most abundant lizards in this particular location. The reproductive condition of the P. m'calli collected here this week has been very similar to that found in the Glamis area animals collected during this same week. Since this has been a very cool spring so far (April in Los Angeles was the coldest April on record), reproduction appears

Phrynosoma m'calli

May 20 Palm Springs Panorama, Riverside Co., Calif.
to be slightly delayed this spring compared to other years from which we have obtained data.

June 7 Shirley Wright + I left UCR at 0600 to get a June sample. We began to look for lizards at 0700, but didn't see any signs of any species active yet. So we waited until 0800 before we began looking again. It was 0845 when we saw the first P. m'calli today. We captured 10 (5 ♂, 5 ♀) by 1100. We looked for lizards until 1125 without seeing another one of this species. The last 2 found were in the middle of the street, and appeared to be mating. However, it was observed upon capture that mating had not yet begun. The hemipenes of the ♂ were not everted, and no traces of seminal fluid was evident when I everted them by pressure. However, the lips of the cloaca of the ♀ were somewhat expanded, indicating that she probably was receptive. The cloacal temperature of both lizards was 42.0°C. Half the lizards were found in the newly established area, and the other half were collected in the oldest Panorama area.

Mayhew 1967

Phrynosoma m'calli

June 15 Palm Springs Panorama, Riverside Co., Calif.

Shirley Wright, Carol Simon, Susan Freeman and I left UCR at 0600 to get a monthly sample of this species. We looked for lizards from 0710 to 1025. During that period, we found 9 lizards. Although the air temperature was only 36.0°C by 1025, it was obvious we were not going to find any ~~more~~ horned lizards this morning (the last one had been seen at 0935). After eating and resting, we went on to the Glamis area.

Glamis area, Imperial Co., Calif.

We looked for lizards from 1610 to 1730 without too much success. However, we did find 4. The weather conditions appeared to be ideal, but lizards just were not found.

June 16 We looked for lizards between the canals from 0715 to 1005. During this period, we found 8 lizards. Air temperature at 1005 was 35.0°C. Lizards were seen between 0740 and 0915. Again, the weather appeared to be perfect for them, but few lizards were seen.

Palm Springs Panorama, Riverside Co., Calif.

July 11 Shirley Wright, Carol Simon + I went after our monthly sample today. We searched in the Panorama from

Mayhew
1967

July 11 Palm Springs Panorama, Riverside Co., Calif.

0635 to 0930, during which time we caught 9 lizards (7 ♂, 2 ♀). However, the lizards were seen only between 0725 and 0900. The air temp. (1 meter) was 37.0°C when we stopped looking for lizards. The animals were a good deal spookier than usual. Four of these animals ran at my approach and were caught with difficulty. Another ran down a hole and escaped. They seemed to be much more prone to run today than I have ever seen them before.

Aug. 15 Palm Springs Panorama, Riverside Co., Calif.

Yehudah Werner & I looked for this species from 0640 to 0930, but saw only 1 animal. The sky was nearly 100% overcast all morning, which may have accounted for the small number being seen. The temperature was quite warm, however.

Glamis area, Imperial Co., Calif.

We looked along the road from 1630 to 1700 without seeing this species. The sky was clear & the temp. quite warm.

Aug. 16 We looked along the same road from 0615 to 1010, but saw only 2 lizards. The weather conditions appeared to be ideal for this species, but few animals.

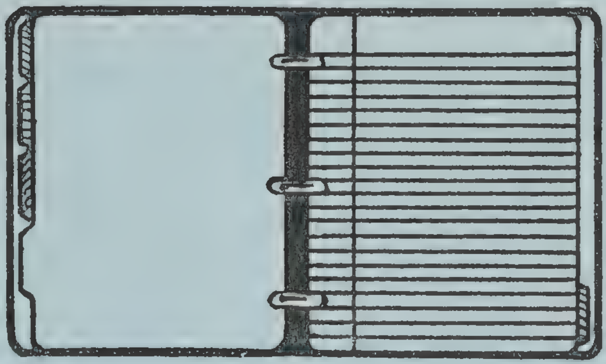
Phrynosoma m'calli

Aug. 17 Palm Springs Panorama, Riverside Co., Calif.

This morning we looked for this species from 0645 to 0945, and again saw only 3 lizards. Weather conditions here today should have been excellent for *P. m'calli* activity, but few were seen. During the past 3 days, we saw only 6 lizards while looking for 10 1/2 hours. Perhaps we have captured most of these lizards that lived close to the roads along which we collect, since we have captured 103 lizards of this species so far this year. I don't know of any other good explanation for these results, because August has been a good collecting month in years past.

Phrynosoma platyrhinos

LOOSE LEAF INDEX



DURABLE INDEX DIVIDERS, SUITABLE FOR SCHOOL OR COMMERCIAL USE

IDEAL FOR CLASSIFYING OR SEPARATING STUDIES, VARIOUS SUBJECTS OR MISCELLANEOUS DATA.

CLASS SCHEDULE

PERIOD TIME	FIRST	SECOND	THIRD	FOURTH	FIFTH	SIXTH	SEVENTH	EIGHTH
COURSE **MONDAY**								
INSTRUCTOR								
COURSE **TUESDAY**								
INSTRUCTOR								
COURSE **WEDNESDAY**								
INSTRUCTOR								
COURSE **THURSDAY**								
INSTRUCTOR								
COURSE **FRIDAY**								
INSTRUCTOR								
COURSE **SATURDAY**								
INSTRUCTOR								

NAME ______________________________

SCHOOL ____________________ CLASS ____________

HOME ADDRESS ______________________________

CITY ____________________ TELEPHONE ____________

Phrynosoma platyrhinos

Phrynosoma platyrhinos

Mayhew
1958

Oct. 17 — 10 mi. E. of Newberry, San Bernardino Co., Calif.
One adult was captured on the sand between the lava flows from Pisgah Crater. The air temp. at this time (1125) was 32.2°C., the soil surface temp. was 47.8°C.

Oct. 24 — 5 mi. W. of 1000 Palms, Riverside Co., Calif.
A juvenal was captured at the base of "Granddaddy Dune" today.

1959

Feb. 20 — 5 mi. N.W. of 1000 Palms, Riverside Co., Calif.
A young animal was caught at 1540 today. It was on a gravelly flat area east of "Granddaddy Dune". It was quite active for that time of day.

Mar. 13 — 11 mi. E. of 29 Palms, San Bernardino Co., Calif.
This morning at 1005 we picked up an adult ♀ sunning on the pavement of the road to Dale Dry Lake. The road surface temp. at this time was 38.0°C. The surrounding area was covered with low creosote bush scrub that looked as though no rain had fallen in the area for some time. Most of the plants looked to be in permanent wilt.

April 9 — 15 mi. E. of Stovepipe Wells, Death Valley Nat'l. Mon., Calif.
An adult ♀ was found sunning on the pavement of the highway

[illegible]

[illegible]

[illegible]

April 9 — 15 mi. E. Stovepipe Wells, Death Valley Nat'l. Mon., Calif.

at 1707. The surface temp. of the road at the time was 35.8°C. I failed to get a cloacal temp. before I released the animal at the side of the road. When I tried to find it again, it had disappeared.

Apr. 30 — 5 mi. N.W. of 1000 Palms, Riverside Co., Calif.

An adult ♂ was captured at the edge of the road at 0645 this morning. The wind was blowing about 25 mph. at the time. The soil surface temp. was only 20.2°C., but it was quite active when Frank picked it up.

May 9 — 7½ mi. W. of Lucerne Valley, San Bernardino Co., Calif.

One animal was found on the flat land covered with creosote bush scrub at the base of the rocky slopes of the Granite Mts.

July 20 — 5 mi. N.W. of 1000 Palms, Riverside Co., Calif.

We released an adult ♂ at 0655 beside an ant hill at collecting station III. It was toe-clipped # 13. Frank Aubrey had rescued it from a cat in Canyon Crest. As we had no collection data for it, we felt it was better to release it.

1961

Sept. 18 — UCR, Riverside campus, Riverside Co., Calif.

A juvenal ♀ was placed in cage # 2 as part of a hibernation experiment. It will be exposed to 8 hrs. of light each day all winter.

Aubrey
1960

Phrynosoma platyrhinos

July 16 - Dale Dry Lake, San Bernardino Co., Calif.

The first lizard captured this morning was a large ♂ *P. platyrhinos* which was sitting on a rock in the gravel pit near which we camped. Three other adult males were collected along the road by Walt Moberly as he patrolled in the car.

One hatchling was collected the previous evening in the bottom of a dry wash.

Sept. 14 — 5 mi. N.W. of 1000 Palms, Riverside Co., Calif.

A young animal (toe-clipped #1) was found within 50 feet of the car as we returned to it after collecting a soil sample.

Sept. 15 — UCR, Riverside Co., Calif.

#1 was placed in cage # 2 (on table). This will receive 8 hrs. of light/day all winter.

1962

Jan. 23 — UCR, Riverside Co., Calif.

The animal in the cold room since Oct. 13, 1961 (#2) was returned to the hot cage in the lab. today. It has been in a cage at room temp. since Jan. 19th.

Feb. 9 — The animal that spent the winter in the cold room has become quite active this past week. It is eating a number of meal worms every day now.

Feb 11 — Laguna Salada, Baja Calif.

James Newlove found a young animal out in the open today. It is obviously last year's hatch.

1963

Sept. 5 — 1 mi. E. of Glamis, Imperial Co., Calif.

I found a DOR that had just been hit this morning. As far as I can recall, this is the first *P. platyrhinos* I have found in the Glamis area. West of Glamis it seems totally

Mayhew
1963

Phrynosoma platyrhinos

Sept. 5 — *1 mi. E. of Glamis, Imperial Co., Calif.* replaced by *P. m'calli*, since I have found over 340 live *P. m'calli* (114 DOR) there without finding a single *P. platyrhinos*.

Phyllorynchus
decurtatus

Phyllorynchus
decurtatus

Mayhew
1959

Phyllorhynchus decurtatus

Apr. 23 — 5 mi. E. of 29 Palms, San Bernardino Co., Calif.

Tonight at 2040 I ran over and killed a young animal that was absorbing heat from the pavement. The air temp. (30") was 24.9°C.; (1cm) was 24.0°C., road surface temp. was 24.0°C. It was in an area covered with creosote bush scrub.

Apr. 25 — 6 mi. N.W. of 1000 Palms, Riverside Co., Calif.

This evening at dusk (1840) a young animal was found on the road between 1000 Palms and Garnet. The wind was blowing 18-20 mph., and the road surface temp. was only 23°C. Nevertheless, it was remaining motionless on the pavement until we approached it on foot.

May 15 — 5 mi. E. of Lucerne Valley, San Bernardino Co., Calif.

An adult that had recently been hit by a car was found on the pavement tonight. It is one of the largest specimens of this species I have seen.

May 23 — 3 mi. W. of 1000 Palms, Riverside Co., Calif.

A young animal was found crossing the old highway tonight, even though the wind was blowing very hard. Twice I reached down to pick it up, and each time the wind blew it beyond my grasp. Finally, on the third attempt, I caught it.

June 9 — 5 mi. N. of Dale Dry Lake, San Bernardino Co., Calif.

A young animal was seen on the road

June 9 5 mi. N. of Dale Dry Lake, San Bernardino Co., Calif.
in the Sheep Hole Mts. The weather was clear and warm, although we didn't record temperatures. Except for a DOR Chionactis occipitalis, no other animals were seen tonight.

June 11 3 mi. W. of 1000 Palms, Riverside Co., Calif.
A young animal was seen on the road tonight. The weather conditions at the time were as follows:

air temp (30") — 32.2°C.
" " (1 cm.) — 32.8°C.
road " — 33.4°C.
Relative humidity — 32%
Wind — N.W. at 11 mph. (gusts to 17 mph.)
Elevation — 550 feet.

1960
Apr. 11 13 mi. E. of Dale Dry Lake, San Bernardino Co., Calif.
An adult, 38 inches long, was found DOR this afternoon. It was the largest snake of this species I have ever seen.

Date [illegible] San Bernardino Co, Calif
[illegible] The weather was
[illegible], although no clouds
[illegible]. Except for a [illegible]
[illegible] on [illegible]
[illegible]
[illegible] Palms, Riverside Co, Calif
[illegible] the
[illegible] The weather conditions
[illegible] the following:
[illegible] — 32.2°C
[illegible]) — 32.8°C
— 33.4°C
[illegible] — 32%
[illegible] 11 mph (gusts to 17 mph)
— [illegible]

Date [illegible] San Bernardino Co, Calif
[illegible] was found [illegible]
[illegible] the [illegible]
[illegible] have [illegible]

R-351

STEEL BACKPLATE

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